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SRA MATHEMATICS LEARNING SYSTEM TEXT 4

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SRA MATHEMATICS LEARNING SYSTEM TEXT

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CONTENTS

1 numeration and rounding

Your goal **2** • Reading and writing numbers • Progress Check **7** • Rounding • Progress Check **13** • More rounding • Applications • Checkout **20**

2 computation + and -

Your goal **22** • Estimating answers for addition problems • Adding two 2-digit numbers • Progress Check **27** • More estimating • Adding two 3-digit numbers • Adding more than two numbers • Progress Check **31** • Estimating answers for subtraction problems • Subtracting two 2- or 3-digit numbers • Progress Check **36** • Applications • Checking subtraction computation • More subtraction practice • Checkout **45**

3 × and ÷ facts

Your goal **47** • Getting ready for multiplication • Skip-counting • Multiplication facts • Progress Check **57** • Getting ready for division • Finding an unknown factor • Repeated subtraction • Relating multiplication to division • Division facts • Progress Check **68** • The numbers 0 and 1 • Checkout **72**

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4 measurement

Your goal **74** • Measuring with centimetres and millimetres • Estimating distances and verifying by measuring • Metres • Symbols for units of measure • Kilometres • Progress Check **83** • Adding and subtracting measurements • Progress check **86** • Investigating systems for telling time • Adding and subtracting units of time • Applications • Checkout **96**

5 multiplication

Your goal **98** • Multiples of 10 • Multiplying a 2-digit factor by a 1-digit factor • Estimation • Progress Check **106** • More estimation • Multiplying a 3-digit factor by a 1-digit factor • A shorter form for multiplication computation • Multiplying two 2-digit factors • Progress Check **117** • Extending skills • Applications • Checkout **120**

6 fractions

Your goal **122** • Naming fractions • Comparing fractions • Progress Check **128** • Renaming 1 and 0 • Adding fractions • Subtracting fractions • Progress Check **140** • Mixed numbers • Checkout **144**

7 geometry-shapes

Your goal **146** • Shapes used in our world • Identifying shapes • Progress Check **152** • Applications • Cubes • Other prisms • Plane figures • Checkout **159**

8 computation +, -, and ×

Your goal **161** • Rounding • Estimation • Adding two 3-digit numbers • Adding two 4-digit numbers • Adding more than two numbers • Subtracting two 3-digit numbers • Subtracting from a 4-digit number • Multiplying by a 1-digit factor • Multiplying two 2-digit factors • More about multiplication • Checkout **188**

9 division

Your goal **190** • Getting ready for division computation • Remainders • Estimation in division • Division practice • Applications • Progress Check **204** • 3-digit quotients • Progress Check **210** • Checking division • Dividing by a 2-digit number • Checkout **216**

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10 math sentences

Your goal **218** • Equality or inequality • Progress Check **221** • True, false, and open sentences • Progress Check **223** • Using math sentences • Progress Check **228** • Using math sentences to check answers • Practice with problem situations • Checkout **235**

11 fractions

Your goal **237** • Fraction models • Comparing fractions • Progress Check **244** • Renaming fractions • Finding the simplest name • Adding and finding the simplest name for the answer • Progress Check **249** • Fractions greater than 1 • Progress Check **253** • Subtracting and finding the simplest name for the answer • Addition and subtraction practice • Checkout **258**

12 measurement—money and mass

Your goal **260** • Writing decimal values • Adding and subtracting money • Counting change • Computing tax • Review of units of mass • Price in relation to unit of measure • Comparison shopping • Supply and demand • Things that affect prices • Checkout **277**

13 probability

Your goal **279** • Making predictions • Tallying predictions • Doing a probability experiment • Comparing results • Showing results on a bar graph • Checkout **288**

14 geometry—congruence

Your goal **290** • Comparing shape and size • Measuring objects • Tracing • Turning congruent figures • Squares • Triangles • Making octagons • Making hexagons • Applications • Checkout **306**

15 a review

A special review chapter

Glossary . Index . Tables of Measures

1 NUMERATION AND ROUNDING

How much do you know about numbers?

—find out!

How far is it from the earth to the moon?
We found these answers:

Newspaper article	380 000 km
Science book	381 000 km
NASA report	371 695 km

A Which is correct? Which is most useful?

How far is it between your city and mine?
We found these answers:

Airline map	2600 km
Road map	3000 km
Atlas	2650 km
Motor club guidebook	2974 km

B Which is correct? Which is most useful?

1. How many different symbols do we need to write any whole number?

Each single symbol is called a digit.

2. There are 11 450 000 people in the city of Tokyo.
   - **a** How many digits are there in the numeral 11 450 000?
   - **b** How many *different* digits are there in this numeral?

3. How many digits are there in the numeral 10? How many different digits?
   - **a** How many digits are there in the numeral 100? How many different digits?
   - **b** How many digits are there in the numeral 1000? How many different digits?

4. How many *different* digits do you need to write your telephone number?
   - **a** How many digits do you think there are in your telephone book?
   - **b** How many different digits are there in your telephone book?

5. What makes one number bigger or smaller than another number?

Because of our place-value system, only ten different digits are needed to name all the numbers we use.

1. Use each of the digits 1, 2, 3. Name as many 3-digit numbers as you can.
   - **a** Which number is the smallest?
   - **b** Which is the largest?

2. Use each of the digits 1, 2, 3, 4.
   - **a** Name the largest 4-digit number you can.
   - **b** Then name the smallest number you can with these four digits.

3. Pick any four different digits. Use each one of them only once to –
   - **a** name the largest number you can.
   - **b** name the smallest number you can.

4. Pick only one digit to write the largest 4-digit number you can.

5. Pick only one digit to write the smallest 4-digit number.

6. Use only the digits in each set below. Write the largest and the smallest 4-digit number you can.
   - **a** 0, 1, 2, 3
   - **b** 2, 4, 6, 8
   - **c** 1, 3, 5, 7
   - **d** 1, 2, 8, 9

7. Use the words "is greater than" or their symbol ">" or the words "is less than" or "<" to replace each ?.
   - **a** 5436 ? 6543
   - **b** 7654 ? 7564
   - **c** 2461 ? 2416
   - **d** 9876 ? 9871

River	Length
Danube	2842 km
Volga	3364 km
Amazon	6400 km
Congo	4350 km

Stop and think. Look at the table at the left.

A Does each 4 in the table have the same value?
B Which 4 has a value of thousands?
C Which 4 has a value of hundreds?
D Which has a value of tens?
E Which has a value of ones?

Use the table at the right for the next questions.

	thousands	hundreds	tens	ones
a	3	7	1	0
b	7	0	3	1
c	1	3	0	7
d	1	0	7	3

1. What is the value of the 7 in each of the numbers?

2. What is the value of the 0 in each of the numbers?

3. What is the value of the 3 in each of the numbers?

Copy and complete.

4. 8940→ ? thousands, ? hundreds, ? tens, ? ones

5. 5007→ ? thousands, ? hundreds, ? tens, ? ones

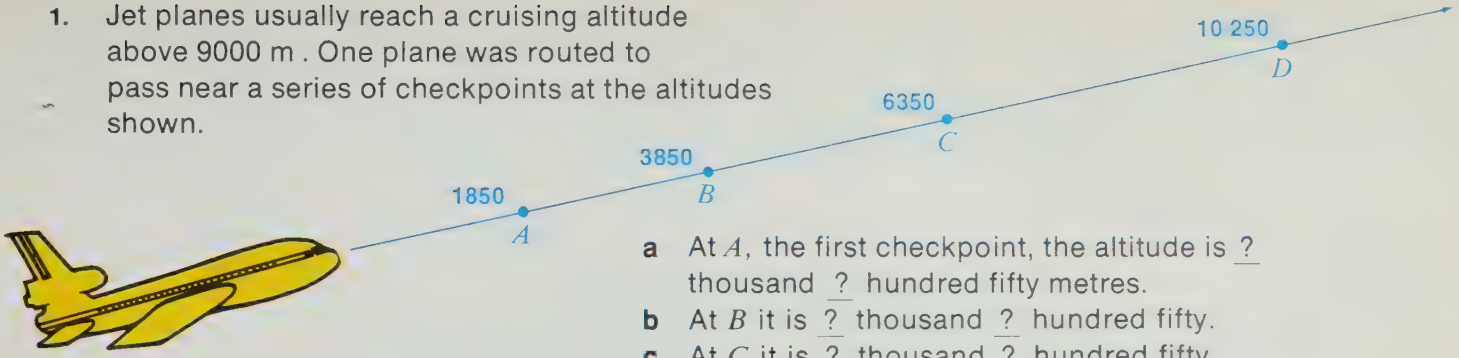
6. 3206→ ? thousands, ? hundreds, ? tens, ? ones

Each digit in the numeral for the length of the Danube has a different value.

2842
2000
800
40
2
2842

7. Tell the value of each digit in the lengths of the other rivers in the table at the top of the page.

1. Jet planes usually reach a cruising altitude above 9000 m . One plane was routed to pass near a series of checkpoints at the altitudes shown.



a At A, the first checkpoint, the altitude is ? thousand ? hundred fifty metres.
b At B it is ? thousand ? hundred fifty.
c At C it is ? thousand ? hundred fifty.
d At D it is ? thousand ? hundred fifty.

	thousands			ones		
	hundred	ten	one	hundreds	tens	ones
a						1
b					1	0
c				1	0	0
d			1	0	0	0
e		1	0	0	0	0
f	1	0	0	0	0	0

2. Look at the table on the left. Be ready to read each number aloud.

3. Is there a number greater than those given in the table? Name one.

4. Large numbers with more than four digits are usually written with a space to the right of the thousands place. So the last number in the chart would be written 100 000.

The 4-digit numbers may be written without spaces, as 1000. Why do you think this is done?

5. Use only the digits in each set below. Write the largest 5-digit number you can and the smallest.
a 0, 1, 2, 3, 4 **b** 4, 7, 9, 5, 1 **c** 7, 0, 1, 9, 8

6. Write the largest 6-digit number there is and the smallest.

Kathy's father is an airline pilot. The family went around the world on holiday. Kathy found these population figures for cities they visited:

Look at the population for Stockholm, Sweden.
This is a big number. The first digit 1 has the value of 1 million.

1. Name one time when you have heard the number one million.

2. Read the population numbers.

3. Read each of these numbers.
   a 365 227 **b** 450 220 **c** 700 530 **d** 698 000 **e** 40 019 **f** 520 416

4. Write the numeral for each number.
   a fifty-six thousand twenty-four
   b sixty-three thousand four hundred six
   c one hundred thirty-six thousand
   d eight hundred thousand six

*5. When you have time, find out—
   a how many people go to your school.
   b how many people live in your community, in your country.

PROGRESS CHECK

Write a riddle.

1. Write a number with four digits—the biggest on the line.
   Use only a bunch of zeros and the digit 9.
2. Write a number with five digits—the smallest you can do.
   Use only a bunch of ones and the digit 2.
3. Write a number with six digits—the only one to write.
   Use the digit 3 because no others are in sight.

We have only 10 different digits. The location of each digit tells how to read the number. It also tells how many. Pretend these numbers tell how many cents you have. Which would you rather have?

4. 19 or 91
5. 911 or 119
6. 191 or 119
7. 1191 or 1911
8. 9111 or 1911
9. 19 111 or 11 911

Write the numbers in each set in order from least to greatest.

10. 955, 559, 595, 95, 59
11. 4774, 4477, 744, 7744, 7474
12. 13 056, 30 561, 51 651, 56 301, 65 310

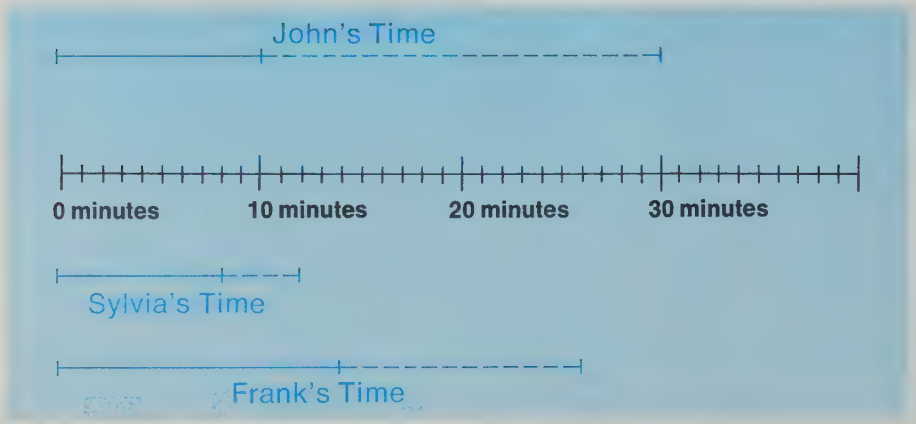
Match the place value listed in column 2 to the value of the digit 5 in each number in column 1.

Column 1		Column 2	
13.	111 115	**a**	ones
14.	511 111	**b**	tens
15.	115 111	**c**	hundreds
16.	111 151	**d**	thousands
17.	151 111	**e**	ten-thousands
18.	111 511	**f**	hundred-thousands

When your mother fixes dinner, she tries to cook *at least* enough to feed everyone but *not more than* they can eat.

When you go on a trip, you try to take *at least* enough clothes for the different things you'll be doing but *not more than* the clothes you can easily carry.

1. John usually walks to school. This takes him *not more than* 30 minutes (unless he fools around on the way). In bad weather he rides the bus. This is faster. But it takes at least 10 minutes.

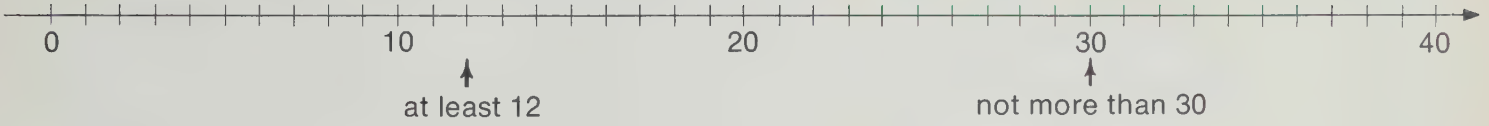


John takes at least 10 minutes but not more than 30 minutes to get to school.

a Frank lives farther away. He always rides the bus. Look at the chart. What is the least time that it takes him to get to school? the most time?

b Sylvia takes at least ? minutes but not more than ? minutes. Why do you think there is so little difference between least time and most time for her?

1. Mary needs a ribbon for her ponytail. It should be *at least* 12 cm long but *not more than* 30 cm long.

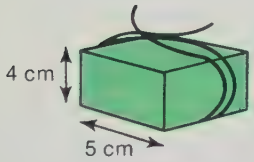


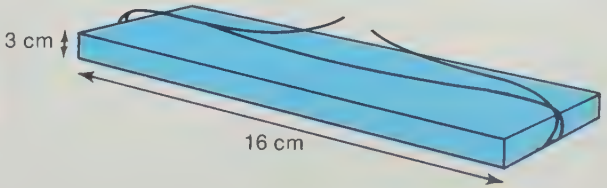
Which of the following ribbons can she use?

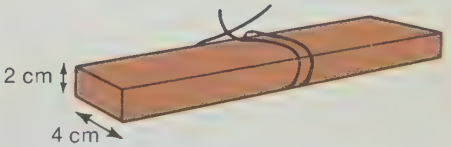
red:	18 cm	pink:	40 cm	brown:	8 cm
blue:	12 cm	green:	30 cm	white:	14 cm

2. These pictures show boxes of three sizes used by a department store. Pieces of string are to be cut and used to tie the boxes. The string is wrapped around the box twice.

Each piece should be long enough to wrap twice around and tie. It should not be so long that string is wasted. What length of string might you choose for each box?







	at least	not more than
a	45	50
b	28	40
c	58	75
d	19	38
e	35	75
f	90	110
g	35	40
h	20	30
i	50	60

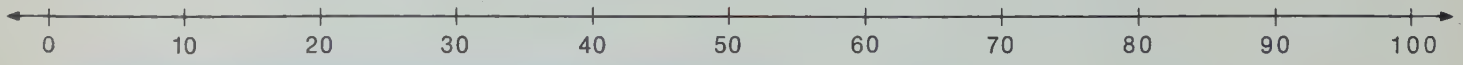
If you're painting a wall, you need at least enough paint for the job. It doesn't matter if you have more than enough. (But you don't want too much left over.)

1. When is it important to have at least enough but not so important to have more than enough?
   - **a** fence for a yard
   - **b** light to read by
   - **c** load to carry
   - **d** money to pay the cashier

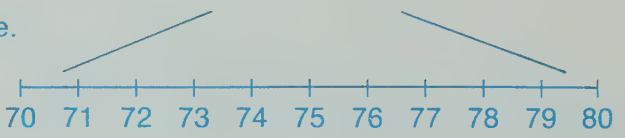
2. You are to be home between 5 and 6 o'clock. What is the last minute you could get home and not be in trouble?

3. When someone says it's 6:35 p.m., is it closer to 6:00 p.m. or 7:00 p.m.?
   - **a** Is 1:30 closer to 1:00 or 2:00?
   - **b** Is 6:00 closer to noon or midnight?

4. Here is a number line marked to show tens.



Here's a magnified view of part of the number line.

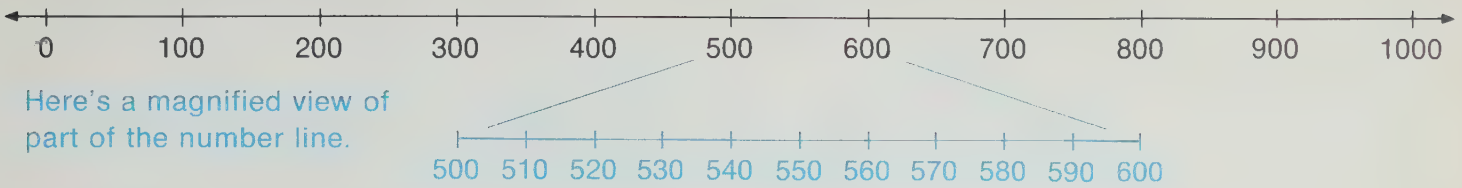


72 is between 70 and 80. Is it closer to 70 or 80?
Since 72 is closer to 70 than to 80, we say that 72 *rounded to the nearest ten* is 70.

- **a** What is 74 *rounded to the nearest ten*?
- **b** What is 79 rounded to the nearest ten?
- **c** What is 76 rounded to the nearest ten?
- **d** What is 71 rounded to the nearest ten?

5. The number line will help you answer the next questions.
   - **a** 13 is between 10 and 20. Is it closer to 10 or 20? What is 13 rounded to the nearest ten?
   - **b** 36 is between 30 and 40. Can it be rounded to 30 or 40?
   - **c** Is 42 rounded to 40 or 50?
   - **d** Is 18 rounded to 10 or 20?
   - **e** Is 55 rounded to 50 or 60?
   - **f** Is 96 rounded to 90 or 100?

The number line below shows hundreds.



Other numbers have been marked on the number line.
580 is between 500 and 600. Is it closer to 500 or 600?

Since 580 is closer to 600 than to 500, we say that
580 *rounded to the nearest hundred* is 600.

1. Round each of the following to the nearest hundred (500 or 600).

a 575 **b** 525 **c** 561 **d** 590 **e** 540

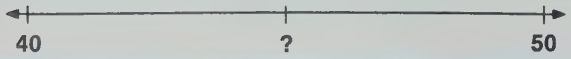
2. Think of the part of the number line between 300 and 400.
Round each of the following to the nearest hundred.

a 306 **b** 386 **c** 346 **d** 320 **e** 370

3. A number line will help you answer the next questions, too.

a Is 120 rounded to 100 or 200?
b Is 530 rounded to 500 or 600?
c Is 460 rounded to 400 or 500?
d Is 955 rounded to 900 or 1000?
e Is 289 rounded to 200 or 300?
f Is 306 rounded to 300 or 400?
g Is 749 rounded to 700 or 800?
h Is 751 rounded to 700 or 800?

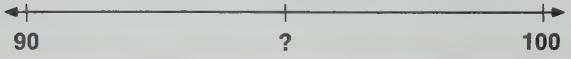
1. Think tens. What number is halfway between 40 and 50? If you rounded this number to the nearest ten, you would round up to 50.



   a What other numbers would you round up to 50? Why?

   b Would you round 41, 42, 43, or 44 up to 50 or down to 40? Why?

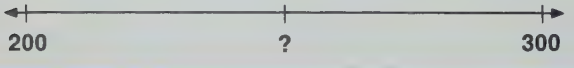
2. Think tens some more. What number is halfway between 90 and 100? If you round this number to the nearest ten, you would round up to 100.



   a What other numbers would you round up to 100?

   b What numbers would you round down to 90?

3. Now think hundreds. What number is halfway between 200 and 300? If you rounded this number to the nearest hundred, you would round up to 300.



   a Which of these numbers round up to 300?
   279 223 249 251 260 225 280 250

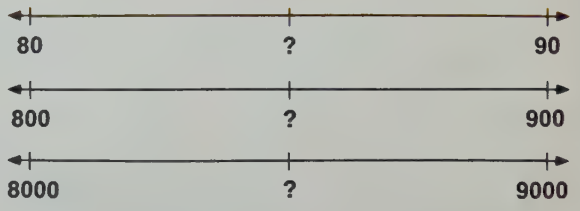
   b Go back.
   Which of the numbers round down to 200?

4. You use the same kind of thinking when you round thousands. Start slowly.

   a What number is halfway between 80 and 90?

   b What number is halfway between 800 and 900?

   c What number is halfway between 8000 and 9000?



   d Which of these numbers would round up to 9000? 8552 8899 8900 8468 8154 8600

   e Which of these numbers would you round down to 8000? 8256 8012 8471 8725 8392 8499

5. Some people need to deal with thousands every day. Newspaper reporters are one group who "think" thousands all the time. It's part of their job.

a Do you think reporters need to know the exact number of people at a football game they report?

b Do they need to know the exact number of people at a car race?

c Do they need to know the exact number of people at a concert?

d Reporters estimate crowds. They determine about how many thousands of people attend sports events. Why?

PROGRESS CHECK

Use a number line if you need help.

What number is—

1. halfway between 0 and 10?
2. halfway between 0 and 100?
3. halfway between 0 and 1000?

What number is—

4. halfway between 50 and 60?
5. halfway between 500 and 600?
6. halfway between 5000 and 6000?

Round each number to the nearest ten.

7. 45
8. 61
9. 79
10. 55
11. 97

Round each number to the nearest hundred.

12. 150
13. 309
14. 777
15. 850
16. 915

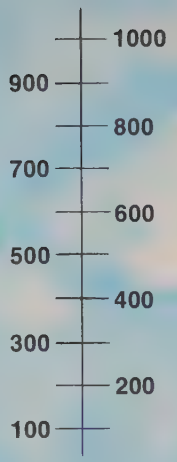
Round each number to the nearest thousand.

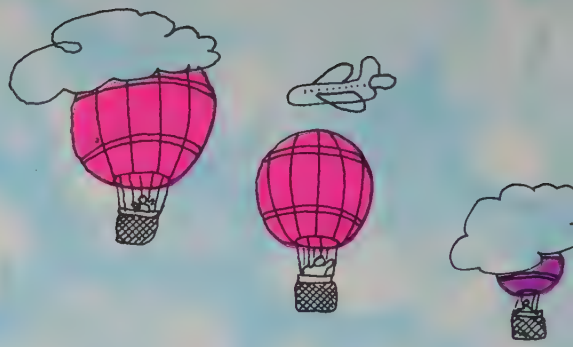
17. 2500
18. 4500
19. 8051
20. 9220
21. 7576

Before you start, make sure you know that 2, 4, 6, 8, and 10 are called even numbers. 1, 3, 5, 7, and 9 are odd numbers.

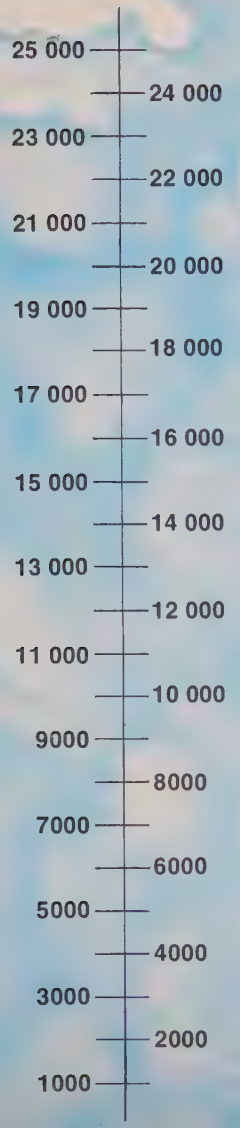
WHAT'S BETWEEN?

The Red Racers and the Purple Pirates are planning a race. To avoid confusion, the Red Racers' balloons will travel at even hundreds of metres above the ground (600, 800, 1000, and so on). The Purple Pirates' balloons will travel at odd hundreds of metres above ground (700, 900, 1100, and so on).





1. Why do you think 800 and 1000 are called even hundreds? Why are 700 and 900 called odd hundreds?
2. Name the even hundreds between ground level and 1000 m .
3. Name the odd hundreds between 500 and 1500 m .
4. Name the even thousands between ground level and 20 000 m .
5. Name the odd thousands between 20 000 and 34 000.
6. What number is halfway between 25 000 and 27 000?
   a halfway between 20 000 and 24 000?
   b halfway between 21 000 and 23 000?
7. A balloon might not be exactly at an even or odd number of hundred metres above the ground. For example, a balloon might be at 710 m .
   Is 710 closer to 700 (odd) or 800 (even)?
   Is 25 100 closer to 25 000 (odd) or 26 000 (even)?



1. On the number line above, A marks the point halfway between 21 000 and 22 000. What number is marked by point A?

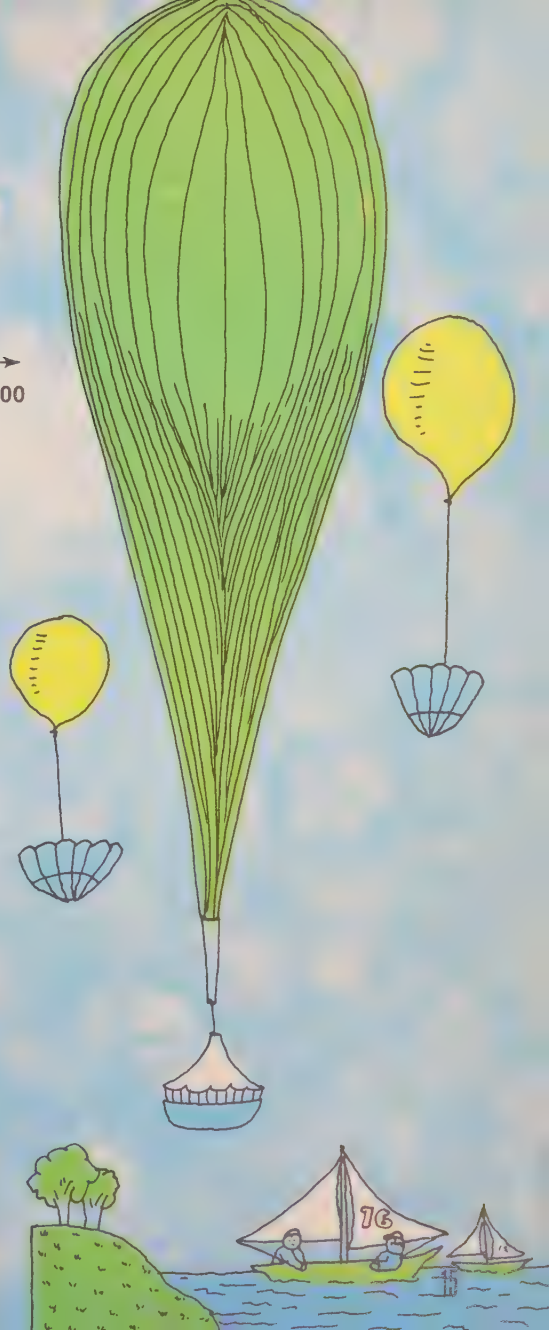
a What number is marked by point B? That number is halfway between 22 000 and 23 000.

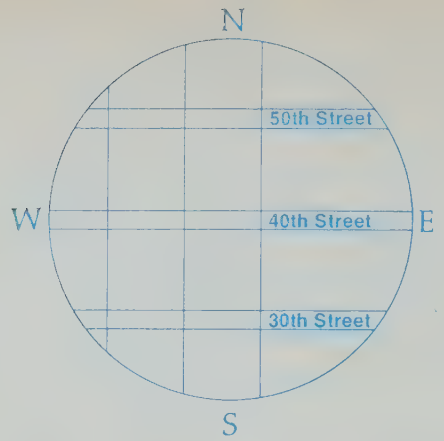
b A weather balloon reaches an altitude of about 22 000 m. Its altitude should be between what two numbers?

c Another unmanned balloon reaches an altitude of about 23 000 m. Its altitude should be between what two numbers?

2. Instruments reported weather balloons at the following altitudes. About how many thousands of metres high was each balloon? (Round to the nearest thousand.)

a	23 200	**b**	23 900	**c**	25 800
d	29 200	**e**	23 800	**f**	32 700
g	29 600	**h**	25 590	**i**	28 300





1. In one part of a city all the east-west streets are numbered. Every tenth street is a four-lane street (30th Street, 40th Street, and so on). When driving east or west, people try to use these streets.

What is the nearest four-lane street if you are on

a 38th Street? **b** 44th Street? **c** 33d Street? **d** 45th Street?

What is the nearest four-lane street if you are on

e 71st Street? **f** 78th Street? **g** 76th Street? **h** 94th Street?

2. The express bus stops at 50th Street, 100th Street, and 150th Street. The following are stops on the local bus route. For each, tell which express stop is closest.

a 128th Street **b** 95th Street **c** 73d Street **d** 60th Street

3. A building has observation decks on the 50th and 60th floors. Which observation deck is closer to the following floors?

a 58th **b** 51st **c** 56th **d** 55th

How Big Is the City?

RECENT CENSUS FIGURES

City	Population
Ottawa	602 510
Winnipeg	540 262
Hamilton	498 523
Edmonton	495 702
Halifax	222 637
Victoria	195 800
Regina	140 734
St. John's	131 814
Saint John	106 744

1. Read the population of each city listed in the table. When do you think the population of Ottawa was exactly the figure given—on the day the census was published? when the census was started? when it was finished?

2. The population of a city changes daily. People move in and out. Babies are born and people die. If we never know exactly what the population is, what does the table tell us?

3. Do you think the population of Edmonton is greater than the population of Hamilton today?

4. Is Halifax larger than Victoria? Is it much larger? About how much?

5. Is St. John's larger than Saint John? About how much?

6. Is Winnipeg larger than Regina? About how much? Is it twice as large?

How close is close enough?

The fish was this big but it got away!
How fast is your bike?
It's a tremendous drive.
We only have a little farther to go.
That's a tall tree!

1. How long is a school year?
   10 months? 36 weeks? 180 days?
   In many places school opens early in September. It closes around the middle of June. So the school year is 10 months long.

   a Suppose school opens the day after Labor Day and closes on the third Friday in June. Then it's ? weeks long. Is Labor Day always on the same date in September?

   b But classes aren't held every day. There are vacation days. There might be only 180 days of classes in a school year. How many vacation days does your school have?

   c Which figure is correct for the length of a school year?

   d Which is most useful?

2. How old is Jack's dog?
   11 years 135 months 586 weeks 4100 days

   a Which is correct? **b** Which is most useful?

If you're buying rock salt to melt the ice on the sidewalk, you *estimate* how much you'll need. But if you're adding table salt to cookie dough, you measure *accurately*.

Tell whether an estimate or an accurate measurement is called for in situation **a** and in situation **b.**

1. Mass

- **a** When you lift a package
- **b** When you mail a package

2. Time

- **a** To run a 100 m race
- **b** To walk home

3. Volume

- **a** Lemonade to drink when you're thirsty
- **b** Lemonade to fill a litre jar

4. Number

- **a** Potatoes in a 5 kg bag
- **b** One baked potato for everyone

5. Length

- **a** The amount of string to fly a kite
- **b** The distance in a race

6. Temperature

- **a** When you're baking a cake
- **b** When you decide which clothes to wear

7. Mass

- **a** Your mass in the nurse's office
- **b** One more person in a boat

8. Time

- **a** When you leave for school
- **b** When you go fishing

9. Volume

- **a** Water to fill a swimming pool
- **b** Water for a cake recipe

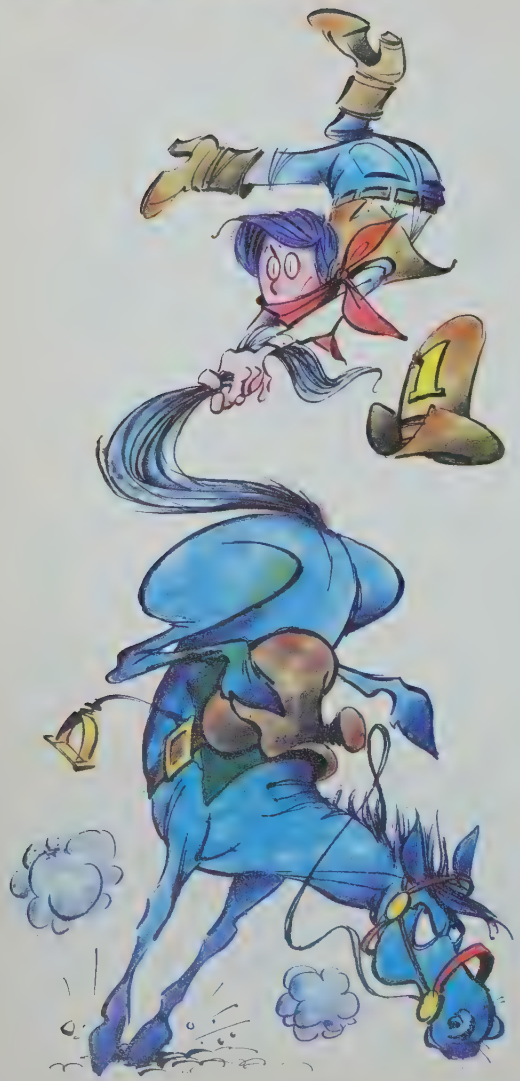
10. Length

- **a** String to wrap a package
- **b** The record for high jump

Talk about this next question.

11. Do you think it is possible to have an exact measurement?

CHECKOUT



1. If you were asked to write the largest number you could, which digit would you use the most?
2. A factory needs 1600 special bolts. They come only in boxes of 1000. How many boxes must be bought?
3. The store needs 950 sale notices. The printer will print them only in groups of 100. How many hundreds must the store order to have enough?
4. The cafeteria needs 32 kg of sugar. They can buy sugar only in 10 kg bags. How many bags must they order?
5. The numeral keys on the typewriter wouldn't work. Jack had to write out all the numbers in this note to his friend.

> I will get into the airport at eight o'clock. My flight should be exciting. They say the plane will fly at an altitude of about nine thousand metres and will have a ground speed of about nine hundred twenty kilometres per hour. The plane will carry three hundred forty-three people. The fuel tanks can hold seventeen thousand eight hundred litres of fuel and the total passenger cargo load may be as much as forty-eight thousand kilograms. Wow! See you soon.

Write the numerals to tell—

a how high the plane will fly

b how fast

c how many people

d how much fuel

e how many kilograms of cargo

2

COMPUTATION + AND −

Have you ever thought of checking the checkout clerk?

1. Mr. Ramsey always double-checks when he buys something at the store. He buys a large can of grapefruit juice for 42¢. He also buys a box of crackers for 49¢. First he estimates his bill by rounding.

42¢ and 49¢ — THINKS →

$$\begin{array}{r} 40 \\ +\ 50 \\ \hline \end{array}$$

About how much does he owe?
Is this exactly what he owes?
What is the exact amount?

2. Mr. Ramsey bought two packages of meat. The chicken was $1.67. The ground beef cost $1.04. How much did he owe for meat?

3. Mr. Ramsey's bill was $3.62 for everything. He paid with a five-dollar bill ($5.00). How much change should he get?

Sometimes you have to compute an exact answer. Sometimes you can estimate an answer.

YOUR GOAL

is to get good
at computation and estimation.

1. Round each number. Then estimate the total for each pair of items.

a 78¢ – sugar
51¢ – tea
estimate – ?

b 43¢ – mustard
54¢ – hotdogs
estimate – ?

c 65¢ – cheese
17¢ – toothpicks
estimate – ?

d 28¢ – beans
37¢ – rye bread
estimate – ?

e What is the exact total for each pair of items?

f Are these totals different from the estimates?

g If Mr. Ramsey had $5.00, would he have enough money to pay for everything listed in this problem?

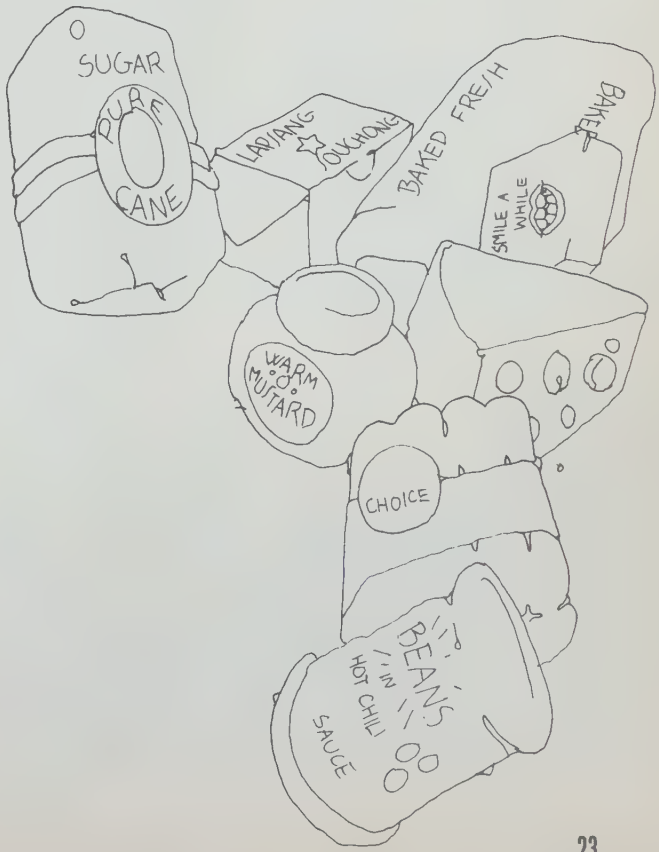
2. A candy bar is 53¢ and a bag of peanuts is 28¢. Mark estimates they will cost about 80¢.

a The clerk said, "79¢, please." Is that close to Mark's estimate? What is the correct total?

b How did Mark make his estimate?

3. Round each number. Then *estimate* each sum.

a 30 + 45	**b** 40 + 16	**c** 50 + 25	**d** 60 + 34
e 36 + 42	**f** 47 + 21	**g** 16 + 53	**h** 52 + 25
i 27 + 33	**j** 65 + 35	**k** 69 + 21	**l** 46 + 44



1. The Groove Record Shop has all the top ten records. The shop keeps some records in the bins and extras in the back room. If the total number of copies drops below 50, more are ordered.

Which records should they reorder today?

	Album Title	Bin	Back Room
a	The Moonstones	23	47
b	Too Many Tears	12	31
c	The Spokesmen	19	36
d	Little Lies	25	19
e	Roof Top Roses	34	20
f	Salad Bowl Blues	33	14
g	Monkey Shines	25	24
h	The Surfs Sing	28	7
i	Stroodle Doodle	32	22
j	Peaches 'n' Cream	19	30

Copy and complete the tables. *Estimate* each sum. Then find the exact sum. Is the estimate close to the exact answer?

2.

		Estimate	Exact
a	39 + 7	?	?
b	41 + 7	?	?
c	44 + 7	?	?
d	45 + 7	?	?
e	46 + 7	?	?

How are these two problems alike?

3.

		Estimate	Exact
a	49 + 17	?	?
b	51 + 17	?	?
c	55 + 17	?	?
d	56 + 17	?	?
e	60 + 17	?	?

How are they different?

1. Copy and complete the table. *Estimate* each sum. Then find the exact sum. Is your estimate close to the exact answer?

		Estimate	Exact
a	$32 + 46$	?	?
b	$52 + 18$	?	?
c	$21 + 49$	?	?
d	$21 + 27$	?	?
e	$33 + 19$	?	?
f	$54 + 16$	?	?
g	$24 + 56$	?	?

2. When you estimate a sum, can the estimate ever equal the exact sum?

3. Murphysville built a new school to combine two of its elementary schools. It will have 50 teacher's desks. These will come from the two old schools. One old school has 28 desks. The other has 37. Will this be enough desks for the new school?

   Do you need to know the exact number of old desks to be sure of the answer?

4. George has 80¢. He wants to buy two magazines. One costs 35¢. The other costs 45¢. Estimate the total cost.

   Do you need to know the exact total cost to be sure that he has enough?

5. Can you think of times that you must find an exact answer?

Four friends handed in their homework. They all had different answers for 28 + 29.

Bob

29
+28
417

John

29
+28
57

Mark

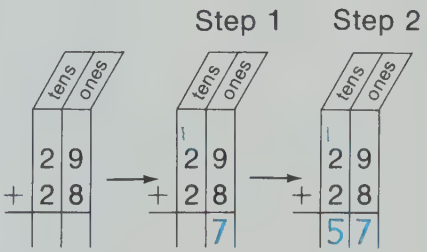
29
+28
147

Ted

29
+28
47

A Do you think that Bob and Mark estimated before they added?
B How did Bob add? What did he forget?
C What slip did Mark make? What help does Ted need?

John's answer was correct.
He found the answer in two steps.



What did he do in step 1?

What did he do in step 2?

1. Your turn. Try to use the steps that John used.

a 36 +47	**b** 48 +15	**c** 65 +29	**d** 62 +29	**e** 34 +37
f 53 +28	**g** 46 +36	**h** 33 +47	**i** 25 +57	**j** 57 +34
k 79 +19	**l** 49 +43	**m** 26 +35	**n** 47 +27	**o** 58 +32

What does the word *assume* mean?
One dictionary says *assume* means "to take for granted; suppose something to be a fact."
What does your dictionary say about the word?

Can we assume that you know how to add two 2-digit numbers? Why don't you check and make sure?

PROGRESS CHECK

Try these.

1. 20 + 50	**2.** 60 + 30	**3.** 80 + 60	**4.** 40 + 70	**5.** 90 + 30	**6.** 60 + 50

Next step. Try these.

7. 34 + 45	**8.** 75 + 23	**9.** 57 + 21	**10.** 46 + 33	**11.** 81 + 18	**12.** 72 + 26

One more step. Keep adding.

13. 67 + 25	**14.** 49 + 28	**15.** 52 + 38	**16.** 36 + 48	**17.** 79 + 17	**18.** 36 + 59

If you get these right, too, you can assume you know how to add.

19. 53 + 49	**20.** 76 + 27	**21.** 85 + 48	**22.** 69 + 66	**23.** 87 + 53	**24.** 48 + 93

Building skills is like building a house. You start with the foundation and work up. Being able to add 2-digit numbers is the foundation. Adding 3-digit numbers is the next step.

Ralph and Jim did this problem for homework.

Ralph

$$\begin{array}{r} {}^{1}3\,46 \\ +\,278 \\ \hline 5124 \end{array}$$

Jim

$$\begin{array}{r} {}^{1}{}^{1}3\,46 \\ +\,278 \\ \hline 624 \end{array}$$

A Who got the problem right?

B Do you think Ralph estimated the answer before he added?

It is usually a good idea to estimate an answer first. Then find the exact sum. Your estimate will help you tell if your answer is reasonable. Does it tell you that your answer is correct?

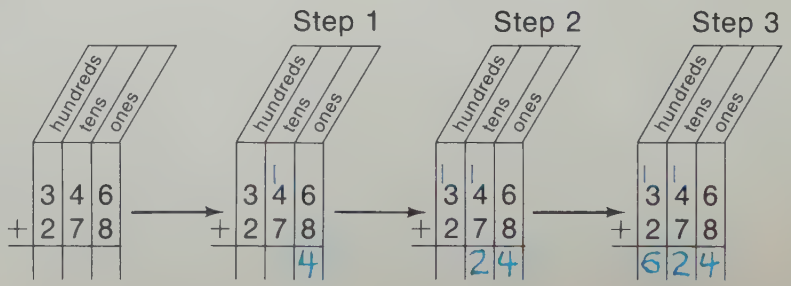
1. There is more than one way to estimate a sum.

a Estimate the answer for 346 + 278 by rounding to the nearest ten. 350 + 280 = ?

b Estimate the answer by rounding to the nearest hundred. 300 + 300 = ?

c What is the exact answer for 346 + 278?
Which of your estimates was closer to the exact answer?
Which estimate was easier to make?

Here is how Jim computed the exact sum.



1. Find the sums for these problems. Estimate the answer first. Then think through each one the same way Jim did.

a	**b**	**c**	**d**	**e**
364	596	639	427	148
+248	+345	+195	+296	+675

2. Write as many exact answers as you can without copying the problem.

+	100
320	420
421	**a**
514	**b**
227	**c**
368	**d**

+	250
108	**e**
430	**f**
526	**g**
418	**h**
607	**i**

+	431
121	**j**
109	**k**
244	**l**
375	**m**
399	**n**

3. The fire department limits the number of people who can be in a theatre. The Roxy Theatre has a limit of 590 people. The ticket taker collected 284 children's tickets and 297 adults' tickets. Is the theatre breaking the fire department's rule? Try to answer by estimating.

4. An elevator has a sign inside that says: Four people get in the elevator. Another man wants to move a desk to another floor. There is room. But is it safe? The masses of the people and the desk are listed.

Warning: Do not overload

In case of emergency, use the alarm or communicator to summon assistance

10 — **Maximum no. of persons**

700 — **Maximum kilograms**

14 450 — Elevator No.

785 West End Ave. — Location

Mr. Larson 94 kg
Mrs. March 83 kg
Miss Small 92 kg
Mr. Fried 117 kg
Mr. Ross 103 kg
desk 191 kg

a Estimate the total mass. Is this a safe load?
b Would there be any reason to compute the exact mass?

1. Jake loved to bowl. He kept a record of his scores for 6 weeks.

Week 1	*Week 2*	*Week 3*	*Week 4*	*Week 5*	*Week 6*
105	114	80	100	95	101
100	90	100	100	97	106
110	104	130	110	115	100

a Estimate the total scores for each week.

b Can you tell his best score without computing?

c Which three-game score was the highest?

2. Jake was on one of the six teams in a bowling tournament. Each team had five members. Prizes are given to the team with the highest team score on a single game. Here are the scores for the players of each team.

Sox	*Cats*	*Astros*	*Cubs*	*Kings*	*Dukes*
106	100	96	123	91	80
112	126	53	114	137	93
105	91	114	108	102	120
89	50	109	121	96	83
78	135	87	73	105	72

a Estimate the total scores for each of the six teams.

b Which team probably won first prize? If you were on the team that came in second, would you be satisfied with an estimate of the score?

c Which team got the booby prize? Are you sure?

Can we *assume* that you know how to add two 3-digit numbers? It's not that we don't trust you, but wouldn't it be better for you to say, "I know I can add two 3-digit numbers!"

PROGRESS CHECK

Try these.

1. 500 + 200	2. 400 + 307	3. 610 + 201	4. 720 + 132	5. 546 + 231

Now try these.

6. 524 + 357	7. 675 + 216	8. 463 + 528	9. 388 + 407	10. 209 + 107

This row will prove you know. Keep on adding.

11. 756 + 164	12. 825 + 198	13. 297 + 703	14. 639 + 584	15. 786 + 867

When you can get all problems like the ones on this page right, you deserve

CONGRATULATIONS

If you need more practice, now is the time to get it. First find out the kind of errors you made. Do you know the facts? Did you estimate before you started computing? Did you make an error in renaming?

1. Have you ever heard someone say that an election is "a close race"? What does that mean?

   a Millions of people vote when there is an election. Imagine you are a TV reporter giving election results in a close race. Would you round votes to the nearest ten? to the nearest hundred? to the nearest thousand? to the nearest million? Explain.

   b If you heard someone say "13 million people voted today," what would you think? Did exactly 13 million people vote? Explain.

   c Sometimes a man with 20 thousand votes will give up before all the votes are counted. Is that a silly thing to do? Why?

When you solve a problem, ask yourself, "What kind of answer do I need? Must I have an exact number? Would an estimate be just as good?"

2. It is 210 km from Nutown to Farley by road. It is 212 km from Nutown to Nero by road.

   a Someone asks you, "Which is farther from Nutown—Farley or Nero?" What would you answer? Does the 2 km difference matter much to a person driving to Farley or to Nero?

   b If you were in the highway planning department, would the 2 km difference matter? (Fact: It could cost over a million dollars to build 1 km of road.)

Estimating helps prevent mistakes when you do subtraction too.

1. *Estimate* the answer for each problem.

a	43 −30	**b**	59 −41	**c**	30 −15	**d**	71 −16	**e**	36 −14
f	76 −19	**g**	43 −24	**h**	68 −30	**i**	95 −46	**j**	87 −38

Compare your estimates with someone else's.
Were there any disagreements?

Estimating can't tell you if your answer is right.

$$\begin{array}{r} 51 \\ -25 \\ \hline 26 \end{array} \text{ rounds to } \begin{array}{r} 50 \\ -30 \\ \hline 20 \end{array}$$

is not equal to

But you know the answer is reasonable.

$$\begin{array}{r} 35 \\ -11 \\ \hline 24 \end{array} \text{ rounds to } \begin{array}{r} 40 \\ -10 \\ \hline 30 \end{array}$$

is not equal to

But you know the answer is reasonable.

2. Go back to problem 1 and find the exact answer to any five problems.

Complete.

3.

Problem	Estimate	Exact
49 − 18	**a**	**b**
88 − 18	**c**	**d**
37 − 18	**e**	**f**
76 − 18	**g**	**h**
55 − 18	**i**	**j**
94 − 18	**k**	**l**

4.

Problem	Estimate	Exact
69 − 8	**a**	**b**
68 − 18	**c**	**d**
67 − 28	**e**	**f**
66 − 38	**g**	**h**
65 − 48	**i**	**j**
64 − 58	**k**	**l**

5. For which problems is the exact answer the same as the estimate?

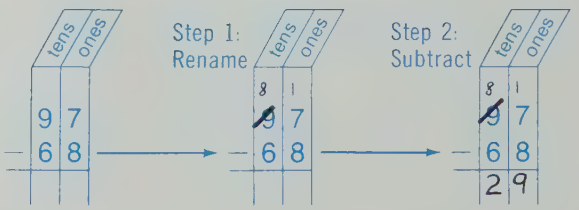
Jerry was counting his stamps. He counted 97. Suddenly a gust of wind blew some of them out of the window. Jerry counted again. Now he had 68 stamps. Jerry said, "That's awful. I've lost 39 stamps."

Jerry thought a minute. 97 stamps—that's almost 100, and 68 stamps is almost 70. 100 − 70 = 30.
He hadn't lost that many stamps. Did he subtract wrong? Jerry computed just to make sure. This is what his work looked like:

$$\begin{array}{r} {}^{8}\not{9}\,{}^{1}7 \\ -\;6\;8 \\ \hline 2\;9 \end{array}$$

Here is how he thought.

Step 1: Jerry renamed 97. Why?
Step 2: Then he was ready to subtract.
Where did the 9 come from?
And how did the 2 get in the tens column?
Is this the way you think when you do a problem like this?



1. Copy and subtract.
Think the way Jerry did.

a	32	**b**	65	**c**	84	**d**	53	**e**	70
	− 17		− 36		− 29		− 15		− 42
f	41	**g**	79	**h**	90	**i**	98	**j**	57
	− 17		− 4		− 39		− 79		− 29

Can you solve a subtraction problem with two 2-digit numbers? If you can, you can solve problems with 3-digit numbers.

1. Let's prove it. Find the differences.

a	**b**	**c**	**d**	**e**
90	700	540	785	365
−40	−300	−130	−384	−165

2. You're on your own. Find the differences.

a	**b**	**c**	**d**	**e**
308	999	706	881	666
−205	−333	−502	−551	−345

f	**g**	**h**	**i**	**j**
385	592	825	650	921
−166	−283	−644	−419	−478

Time to look at some more problems like the last row.
Did you use a way like this?

Step 1

$$\begin{array}{r} {\scriptstyle 4\ 1} \\ 7\not{8}1 \\ -\ 164 \\ \hline 7 \end{array}$$

Step 2

$$\begin{array}{r} {\scriptstyle 6\ 14\ 1} \\ 7\not{8}1 \\ -\ 164 \\ \hline 87 \end{array}$$

Step 3

$$\begin{array}{r} {\scriptstyle 6\ 14\ 1} \\ 7\not{8}1 \\ 164 \\ \hline 587 \end{array}$$

Or did you do all the renaming first?

Step 1: Rename.

$$\begin{array}{r} {\scriptstyle 6\ 14\ 1} \\ 7\not{8}1 \\ -\ 164 \end{array}$$

Step 2: Subtract.

$$\begin{array}{r} {\scriptstyle 6\ 14\ 1} \\ 7\not{8}1 \\ -\ 164 \\ \hline 587 \end{array}$$

Either way is O.K.

Dan was having trouble with subtraction.
Look at the three problems he did. Where did he make errors?

$$\begin{array}{r} 490 \\ -\,156 \\ \hline 346 \end{array}\times \qquad \begin{array}{r} {}^{11} \\ 526 \\ -\,278 \\ \hline 348 \end{array}\times \qquad \begin{array}{r} {}^{2}\,{}^{1} \\ 502 \\ -\,178 \\ \hline 174 \end{array}\times$$

If it was your job to help him, what would you do?

PROGRESS CHECK

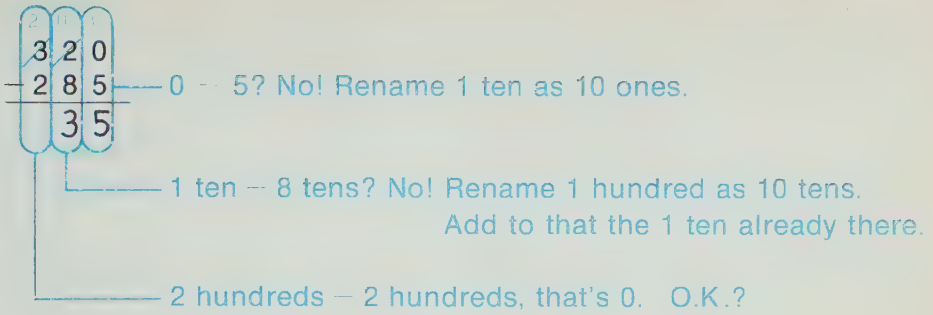
Each one of these problems is a bit different from the others. Copy each problem. Think about what you are doing as you subtract each problem.

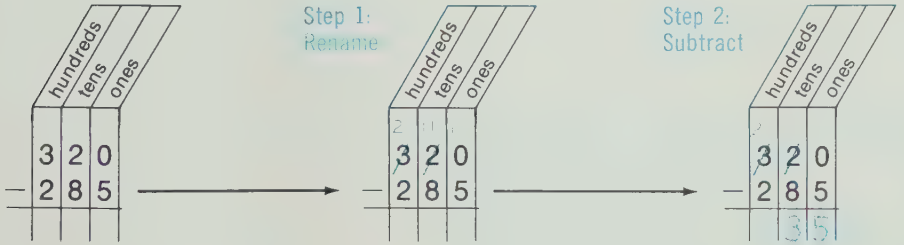
(1.) $\begin{array}{r} 375 \\ -\,261 \\ \hline \end{array}$	(2.) $\begin{array}{r} 390 \\ -\,152 \\ \hline \end{array}$	(3.) $\begin{array}{r} 370 \\ -\,164 \\ \hline \end{array}$	(4.) $\begin{array}{r} 735 \\ -\,473 \\ \hline \end{array}$
(5.) $\begin{array}{r} 648 \\ -\,577 \\ \hline \end{array}$	(6.) $\begin{array}{r} 827 \\ -\,568 \\ \hline \end{array}$	(7.) $\begin{array}{r} 402 \\ -\,397 \\ \hline \end{array}$	(8.) $\begin{array}{r} 500 \\ -\,324 \\ \hline \end{array}$

If you can spot how each one is different from the others, you deserve an award. If you got them all right, you deserve an even bigger award.

Don't be discouraged if you made some errors. The next page will help.

Ken's father wants to trade in his old car. One used-car dealer has offered $320 for the car. Another dealer has offered $285. How much difference?


3 2 0
− 2 8 5
3 5
0 − 5? No! Rename 1 ten as 10 ones.
1 ten − 8 tens? No! Rename 1 hundred as 10 tens.
Add to that the 1 ten already there.
2 hundreds − 2 hundreds, that's 0. O.K.?



1. Copy each problem. Estimate each answer by rounding to the nearest hundred. Then find the exact answer.

a 665 − 534	**b** 714 − 506	**c** 286 − 179	**d** 485 − 326	**e** 532 − 289	**f** 893 − 499

2. Subtract. Think carefully each time you rename a number.

a 934 − 228	**b** 628 − 179	**c** 605 − 417	**d** 211 − 19	**e** 456 − 148	**f** 751 − 164
g 305 − 198	**h** 600 − 456	**i** 740 − 473	**j** 807 − 398	**k** 700 − 623	**l** 900 − 891

1. A company that makes hair spray is trying to figure out what to charge for its product. Another company charges $1.24. Should the new company charge the same or charge an even $1.25?

   a If you were buying a can of hairspray, would a 1¢ difference matter to you?

   b Pretend you are the president of the company. You expect to sell 2 million cans a year. Would the 1¢ difference in price matter?

2. Walter would like to buy a desk. It is 73 cm wide.

   a Would it matter to you that the width of the desk is 73 cm? Would you be just as happy with a desk that is only 72 cm wide?

   b Could the exact width of the desk make a difference? What if the door to Walter's room is narrow?

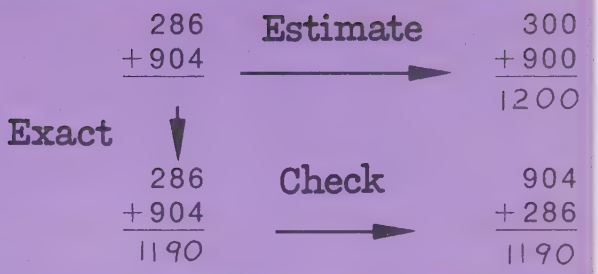
3. A newspaper reporter writes a story that is 851 words long. Another reporter writes a story 793 words long.

   a Round to the nearest hundred. Then estimate the difference in the lengths of the stories. If you were reading the stories, would this difference matter much to you?

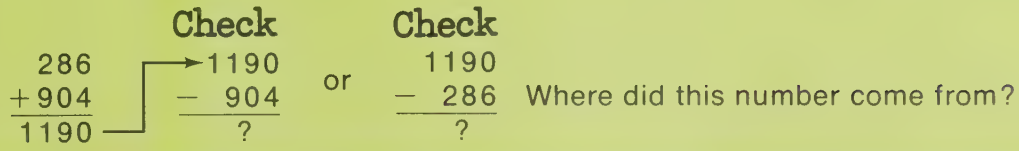
   b Suppose you work for the newspaper. You need to know which story will fit best on page 2. Would you estimate or find the exact difference?

4. Tell about a situation where it would be important to know the exact difference between two numbers. Report a situation where an estimate would be O.K.

When you add, how can you tell if your answer is right? An estimate will help you know your answer is reasonable. One way to check your answer is to reverse the order of the numbers to be added.



Subtraction undoes addition. So you can also check addition by subtracting.



1. Estimate, add, and check by reversing the order of the numbers added. (This method won't help much if you don't know your addition facts.)

a	**b**	**c**	**d**	**e**	**f**
513 +711	307 +299	921 +387	4185 +4577	2649 +5420	5876 +3048

2. Estimate, add, and use subtraction to check.

a	**b**	**c**	**d**	**e**	**f**
341 +586	411 +579	366 +485	2935 +4508	7928 +2197	8047 +3609

3. Can you figure out a way to check with subtraction without recopying the whole problem?

You can check an answer to a subtraction problem too.

When you subtract, estimate the answer and then compute the difference. Check your answer by adding it to the number you subtracted.

What number should you get?

$$\begin{array}{r} 415 \\ -297 \\ \hline 118 \end{array} \quad \text{exact}$$

$$\begin{array}{r} 415 \\ -297 \\ \hline \end{array} \quad \text{estimate} \rightarrow \quad \begin{array}{r} 400 \\ -300 \\ \hline 100 \end{array}$$

$$\begin{array}{r} 118 \\ +297 \\ \hline 415 \end{array} \quad \text{check} \rightarrow$$

1. Estimate, subtract, and check by addition.

a	**b**	**c**	**d**	**e**	**f**
587	714	350	625	831	902
−392	−228	−234	−428	−179	−563

2. The chart shows the length of four rivers.

River	Length (kilometres)
Saint John	669
Ottawa	1114
Fraser	1360
Nile	6699

a How much longer is the Ottawa River than the Saint John River?

b How much longer is the Fraser than the Ottawa? than the Saint John?

c How much longer is the Nile than the Saint John? than the Ottawa? than the Fraser?

3. Do you think that the length of each river is *exactly* what is stated in the table?

a How do you think these lengths were determined?

b What makes a fact a fact?

EXTRA

Plan with your teacher. Decide what to do with these pages.

1 Add. Check your answers. Make sure things are reasonable.

a 68 + 21	**b** 47 + 23	**c** 58 + 91	**d** 97 + 23	**e** 86 + 57
f 31 + 74	**g** 85 + 19	**h** 814 + 33	**i** 754 + 28	**j** 685 + 56
k 168 + 681	**l** 477 + 918	**m** 605 + 409	**n** 1297 + 3916	**o** 9118 + 882

4 Use the table to answer these questions. Estimate the answers.

a How many more people live in Haunted Heights than in Wizard Park? What is the population of both together?

b What is the combined population of Blighted Bluffs, Witchtown, and Dead Man's Cove?

c Which has the larger population — Dragon Flats or all the rest of Monsterville? How much larger? What is the population of the whole of Monsterville?

Population of Greater Monsterville

Dragon Flats	33 215
Wizard Park	9 304
Haunted Heights	9 609
Blighted Bluffs	8 257
Witchtown	1 214
Dead Man's Cove	5 009

Back to next page

Subtract. Check your answers.

a 93 −72	**b** 46 −27	**c** 591 − 99	**d** 235 −107	**e** 614 −307
f 734 − 34	**g** 102 − 39	**h** 200 − 52	**i** 500 −499	**j** 192 − 93
k 178 − 89	**l** 823 − 76	**m** 768 −427	**n** 267 −159	**o** 405 −396

Señor Sanchez is an artist.

a He sold three paintings last month for $50, $133, and $185. About how many dollars did he get?

b The month before he sold four paintings. One sold for $75, another for $50, a small one for $12, and another for $68. About how many dollars did he get for his paintings that month?

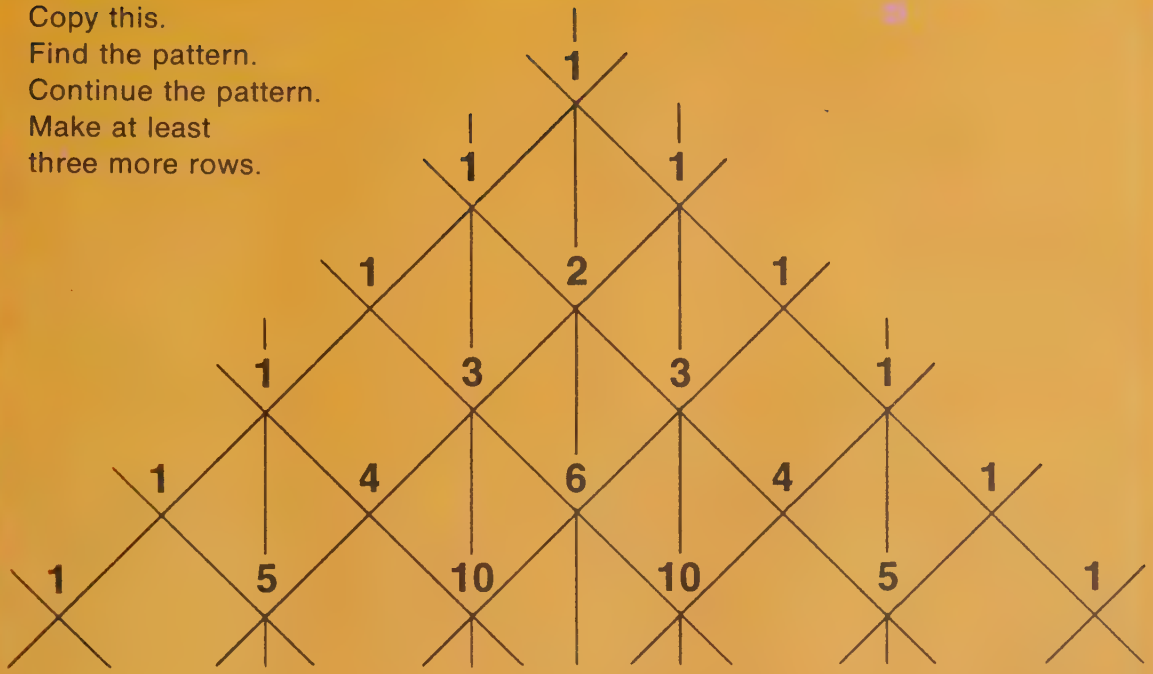
c The señor had a lot of bills to pay:

Rent	$100
Art supplies	$ 56
Dentist bill	$ 86
Clothing bill	$ 95
Groceries	$ 37

Estimate whether the señor earned enough in the two months to pay his bills.

Just for fun

Copy this.
Find the pattern.
Continue the pattern.
Make at least
three more rows.



How many patterns can you find?
Look for them in each row.
Look for patterns on each diagonal.
Are there patterns in each column?
What is the sum of the numbers in each row?

ANGORA CAT— $15. Will sacrifice to good home. Needs shots. Call 999-0001.
BASSET HOUND PUPS, $25 each Cute and clumsy. Call 999-1111 for information.
STRAY KITTEN FOR SALE. $5 to good home. Call 999-1001 before 7 p.m.
Persian kittens for sale. Purebred. $30 each, with papers. Have had distemper, pneumonitis, and rabies shots. Call 999-1101.
SHAGGY DOG PUPS. $10 each. 4 weeks old. Call 999-1100.
Rin-Tin-Tin, Dam from International Champion Bodo Vom Lierberg. Black and Tan, also Sables. 6 wks. To be sold for show and good homes only. M or F $150
SHEPHERDS, pure
GERMAN Shep. 2 yrs., lge lbs. Gd. watchdog, gd.
GERMAN Shepherd, bei pies, 8 wks., lge. bone, wrmd., paper trnd., $75-
GERMAN SHEPHERDS $25-$30 COLLIES $20-FARM BRED PUPS 748-8484
GERMAN Shortha
GERMAN breed. Male $300 for bott
GERMAN S. champion blo $125.
GERMAN She AKC, shots, to show, 9 male. $5
GERMAN Shep., fawn, loves kids, $
GERMAN Shephe old, hsebrkn. $20. B
GERMAN Shep. pups, AKC. parents
$100 each.
POODLE pup, bl. min., male, wks., AKC, frisky, loveable, perfec for family-child, $100.
POODLES-toys, pups, AKC, apric & black. $75.
POODLE-pups, AKC, toy min. M F., 8 wks. $65.
POODLE AKC tiny toy, blk. F beaut., paper trnd. $150.
POODLES, tiny toy apricot. AKC F-F. $125-$150.
POODLES, min. Apricot, M & F, wks., AKC, $85.
POODLE Miniature, AKC reg., male
female pup, AK
SCHIPPERKE pups, AKC, Phone—414-674-4513
SCHAUZER min. AKC, let blk., F 10 wks., home
SHEPH
male, good wh
ch dog. Want
225-6575 aft.
WEIMARANERS AKC, $100-$1
aft. 5 p.m. (219) 769-42
WEIMARANER-AKC. 7 mos. $100
496-3720. Call anytime.
WELSH Corgi, Pembroke-AKC, 2
$150 eg., 1 F, $100, 5 mo. 1 F $75,
yrs. 517-269-6664
YORKSHIRE TERR. Ch. Ped
male 12 wk. puppies. $135-$200
3593
YORKSHIRE terrier puppy, M. 8 wk
AKC. $125.
YORKIE pups, Fem., $85-$125.(81
932-7547
M-17 CATS & OTHER PETS
SMALL parrot with cage, $40 or be
offer.
KITTENS (4) free approx. 8 wks.
housebroken.
SIAMESE sealpoint kittens, 7 wks
fem., litter trained. $25.
SIAMESE kittens, reg., seal & blu
ART & ANTIQUES
BICYCLES & TOYS

Billy wants to buy a pet but he's not sure whether to buy a dog or a cat. He knows these facts:

a Dogs have to have licences.
The licence costs $10.00.

b Dogs have to have rabies and distemper shots.
The shots cost $25.00.

c House cats do not have to have shots,
but his mother would want a cat to
have rabies shots. This series of shots
would cost $15.00.

d House cats use up a bag of cat litter a week.
Litter costs 50¢ a bag.

e Dogs eat one can of food a day.
Dog food costs 19¢ a can.

f Cats eat one can of cat food a day.
Cat food costs 11¢ a can.

1. Would there be any other costs to consider?

2. Which of the five animals would be the cheapest to buy and own?

Which animal would you choose?
What other things might influence your decision?

CHECKOUT

1. Add 2-digit numbers.

a	24 +35	**b**	76 +17	**c**	53 +17	**d**	94 +63	**e**	80 +37
f	97 +15	**g**	86 +73	**h**	54 +68	**i**	37 +18	**j**	76 +45

2. Add 3-digit numbers.

a	462 +425	**b**	270 +404	**c**	545 +407	**d**	766 +708	**e**	465 +269
f	721 +695	**g**	818 +519	**h**	961 +498	**i**	639 +169	**j**	882 +267

3. Subtract. You will have to copy these problems.

a	76 −53	**b**	48 −14	**c**	366 −253	**d**	858 −237	**e**	849 −345
f	64 −45	**g**	75 −47	**h**	861 −164	**i**	930 −335	**j**	700 −672
k	437 −381	**l**	604 −137	**m**	595 −196	**n**	558 −486	**o**	586 −289

4. Complete. **WATCH OUT!**

a	578 +422	**b**	500 −499	**c**	378 −269	**d**	562 +537	**e**	802 −713

3
X AND T
FACTS

You know how to add and subtract. Find out how good you are with multiplication and division. Your

GOAL

is to get really good.

1. Roller coaster
4 cars—8 seats each
How many seats in all?

- **a** Can you add to find the answer?
- **b** Can you multiply to find the answer?
- **c** What is the answer?

2. Toy train
Engine—10 wheels
Freight car—8 wheels
Boxcar—8 wheels
How many wheels?

- **a** Can you add to find the answer?
- **b** Can you multiply to find the answer?
- **c** What is the answer?

3. Buttons
6 on a jacket
6 on a shirt
6 on a sweater
How many buttons?

- **a** Can you add to find the answer?
- **b** Can you multiply to find the answer?
- **c** What is the answer?

4. Can you always add rather than multiply?

5. Can you always multiply rather than add?

6. Decide whether it is best to add or multiply to find an answer.

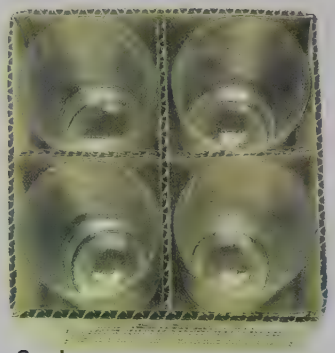
- **a** 7 apples, 7 pears, 7 plums, 7 oranges. How many?
- **b** 9 carrots, 9 potatoes, 9 onions. How many?
- **c** 6 colas, 6 orange sodas, 5 root beers. How many?
- **d** 8 red, 8 blue, 8 yellow, 8 green. How many?

7. What operation do you use to find these answers?

- **a** 54 chairs in all. There were 6 rows. How many chairs in each row?
- **b** 72 stamps in the book in all. 9 on each page. How many pages?

Is it your job to carry out the trash? There are usually a lot of boxes. There are big boxes, little boxes, sturdy boxes, thin boxes. Each had a purpose. In fact, much time was spent in planning shapes and sizes.

Today it is your job to plan boxes for drinking glasses. A box to hold 4 glasses would probably look like this:



Draw a box to hold 6 glasses
8 glasses
9 glasses How many rows in each box?
10 glasses How many glasses in each row?
12 glasses
16 glasses

Most boxes are made by machine. Every time a different-sized box has to be made, the machine has to be changed. Boxmakers try to get their customers to use a standard-size box. A shoe box is an example of a standard-size box. Various sizes of shoes all fit into the same-size box. Why would a standard-size box be cheaper to buy?

Here is a picture of a box that games are packed in.
It measures how many units wide? how many units long?

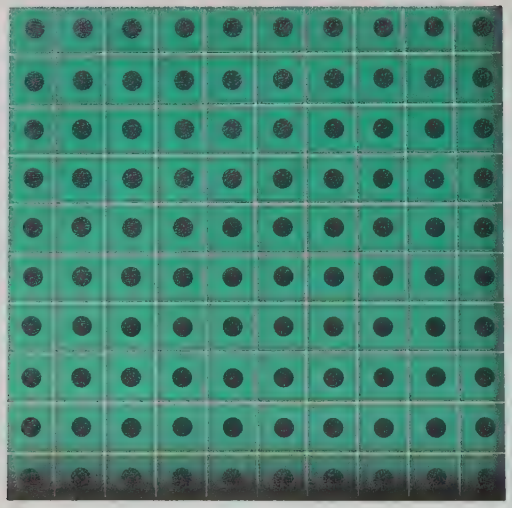
1. **a** Could you put a game board that measures 3 units by 4 units in the box?
   b How many square units would it cover?

2. **a** Can a 5-by-10 game board go in?
   b How many square units would it cover?

3. **a** Can you put an 8-by-9 game board in?
   b How many square units would it cover?

4. **a** How many square units would a 7-by-6 game board cover?
   b How many for a 6-by-6 board? for a 10-by-10 board?

Games often come in boxes that are larger than needed. It's because the manufacturer wants to use a standard box size. This keeps the cost of the box lower. He then puts in a stuffer to fill up the empty space. How would a standard box size for a set of games be determined?



How many rows of dots in the grid?
How many dots in each row?
How many dots in all?

Take a sheet of paper.
Fold it in half.

Fold it in half again.

Open the paper.
Tear out one fourth.

Use this paper as a mask to show arrays of dots in the grid above.

Place the mask over the grid so only 14 dots show.
How many rows show? How many dots in each row?
Can you show an array of 14 dots by placing the mask in another position?

1. Show 12 dots. How many rows? How many dots in each row?
   How many ways can you show 12 dots?

2. Show 16 dots. How many rows? How many dots in each row?
   How many ways can you show 16 dots?

3. Look out for this one!
   Show 24 dots. How many rows? How many dots in each row?
   How many ways can you show 24 dots?

A

B

1. How many glasses would fill each box?
How are the boxes alike?
How are they different?
Could these be pictures of the same box?

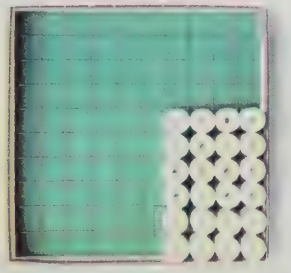
2. How many glasses would fit in each of these boxes? How are these boxes alike?
How are they different?
Could any two of these be pictures of the same box?

A

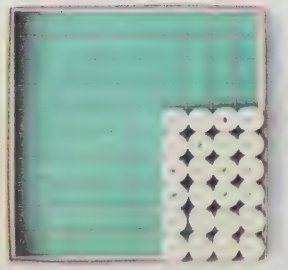
B

C

3. It was inventory time in the dime store. The manager hired extra people to help count all the things he had in the store. Bill and Tim started counting the number of spools of thread.

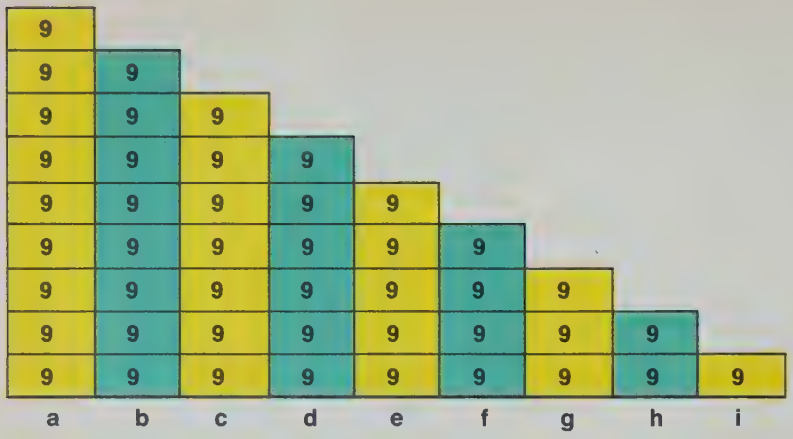


Bill thought
$6 + 6 + 6 + 6$
and wrote 24
on the top of
the box.



Tim thought
4×6
and wrote 24
on the top of
the box.

a Were there the same number of spools in each box?
b Were there the same number of rows?
c Were there the same number of spools in each row?
d Who do you think might be able to work faster?



1. There is no doubt about it, you can add *or* multiply if you have one or more dots or objects in sets AND if you have the same number in each set. Here are stacks of boxes. Each box contains 9. Add or multiply to find how many in each stack.

2. That first stack is a tall one! How many in all in that stack?

READY FOR MULTIPLICATION PRACTICE?

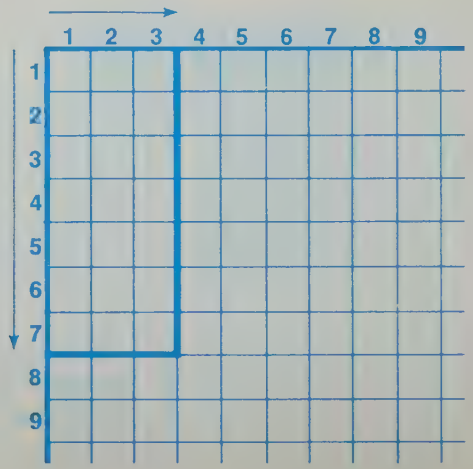
Have you forgotten the multiplication facts?
Here is a good way to review. It is the same idea as arrays.

The only thing that's different is that the grid is marked with numbers.

Let's say you have forgotten the product of 7 × 3.
Look at the grid. Read 7 down. Read 3 across.
You could just count the number of squares in all.

But it is faster to skip-count.

You can skip-count by 3s or skip-count by 7s to find how many in all.



1. How good are you at skip-counting? Find out.

a Count by 2s to 18. Why 18?

b Count by 3s to 27. Why 27?

c Count by 4s to 36. Why 36?

d Count by 5s to 45. Why 45?

e Count by 6s to 54. You know the question.

f Count by 7s to 63. Why?

g Count by 8s to 72. You'd better know why by now.

h Count by 9s to 81.

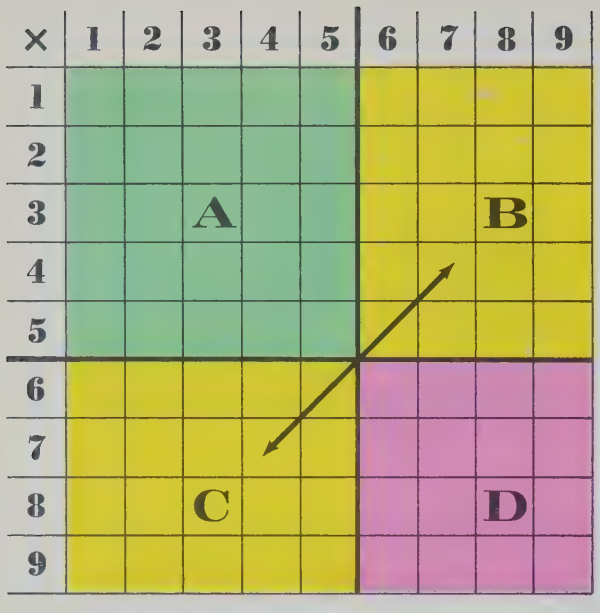
2. Skip-counting can be just as hard as adding sometimes. So get ready to tackle this problem—the easy way.

a Copy and complete this table. Put a little mark in any box where you had to stop and think before you could write the answer. If you're honest with yourself, you'll know which facts need practice.

b Look for patterns in your table. Look at just the 5-column. Do you see your skip-counting numbers? Now look at the 5-row. What do you see?

c On your table draw a diagonal line from the top left corner of the table to the bottom right corner, like this: What do you see in the two parts?

×	1	2	3	4	5	6	7	8	9
1	?	2	?	?	?	?	?	?	?
2	?	?	?	8	?	?	14	?	?
3	?	?	9	?	?	?	?	?	27
4	4	?	?	?	?	24	?	?	?
5	?	?	?	20	?	?	?	40	?
6	?	12	?	?	30	?	?	?	?
7	7	?	?	?	?	?	49	?	?
8	?	?	24	?	?	?	?	64	?
9	?	?	?	?	?	54	?	?	81



This blank table is like the one that you have.

1. Most people think the facts in the part of the table labelled **A** are the easiest. Do you agree?

2. Most people think the facts in section **D** are the hardest. Do you agree?

3. You do know the secret of sections **B** and **C**, don't you?

$4 \times 5 = 20$ $\quad$ $\begin{array}{r} 5 \\ \times 4 \\ \hline 20 \end{array}$ $\quad$ **How are these alike? How are they different?**

Multiplication is a skill. To be able to multiply quickly you need practice. You know how to write the problem. BUT do you know the answers?

Time to check out section **A** on your table. Put a sheet of paper under the first row. Write only the answer on the paper.

Keep going.

	a	b	c	d	e	f	g
4.	$\begin{array}{r} 2 \\ \times 1 \end{array}$	$\begin{array}{r} 3 \\ \times 3 \end{array}$	$\begin{array}{r} 1 \\ \times 4 \end{array}$	$\begin{array}{r} 4 \\ \times 3 \end{array}$	$\begin{array}{r} 5 \\ \times 5 \end{array}$	$\begin{array}{r} 2 \\ \times 2 \end{array}$	$\begin{array}{r} 5 \\ \times 4 \end{array}$
5.	$\begin{array}{r} 3 \\ \times 2 \end{array}$	$\begin{array}{r} 5 \\ \times 3 \end{array}$	$\begin{array}{r} 1 \\ \times 2 \end{array}$	$\begin{array}{r} 2 \\ \times 5 \end{array}$	$\begin{array}{r} 2 \\ \times 4 \end{array}$	$\begin{array}{r} 3 \\ \times 4 \end{array}$	$\begin{array}{r} 4 \\ \times 4 \end{array}$
6.	$\begin{array}{r} 4 \\ \times 1 \end{array}$	$\begin{array}{r} 1 \\ \times 1 \end{array}$	$\begin{array}{r} 3 \\ \times 1 \end{array}$	$\begin{array}{r} 4 \\ \times 5 \end{array}$	$\begin{array}{r} 2 \\ \times 3 \end{array}$	$\begin{array}{r} 5 \\ \times 1 \end{array}$	$\begin{array}{r} 4 \\ \times 2 \end{array}$

Now, that wasn't so bad. Are you operating as fast as you would like to?

Now to check out sections B and C facts.

	a	b	c	d	e	f	g
1.	9 × 2	7 × 4	6 × 5	8 × 3	7 × 1	6 × 2	8 × 5
2.	2 × 8	5 × 9	2 × 7	1 × 6	4 × 8	5 × 7	4 × 9
3.	4 × 6	7 × 3	8 × 1	3 × 9	6 × 3	1 × 9	You're free! Guess why.

If you know 4 × 6, you also know 6 × 4. You found the product of one of each pair of facts in sections B and C.

One more section to go. Be sure to remember those facts that give you a hard time.

	a	b	c	d	e	f	g
4.	6 × 6	8 × 8	8 × 6	9 × 7	7 × 8	6 × 7	9 × 6
5.	7 × 6	8 × 9	6 × 9	8 × 7	7 × 9	6 × 8	7 × 7

There were only 2 nine-facts that you didn't do. 9 × 8 and 9 × 9. Time out to look at the nine-facts all by themselves. There is a great way to remember them if you have trouble. Do the facts in order. Then take a good look at the digits in the product.

6.	1 × 9	2 × 9	3 × 9	4 × 9	5 × 9	6 × 9	7 × 9	8 × 9	9 × 9

Computing numbers may be one thing. Figuring out real situations involving numbers may be another.

1. Think carefully. You know 5×8 is the same as 8×5. But are 5 items that cost 8¢ apiece the same as 8 items that cost 5¢ apiece? Would it make a difference in the amount of money you pay? Would it make a difference in the number of items you carry?

2. You know 4×9 is the same as 9×4. Think about seats at a puppet show. Are 4 rows with 9 seats the same as 9 rows with 4 seats? But how many seats in all?

3. Is 3×8 the same as 8×3? Think about watching TV. Is 3 hours each day for 8 days the same as 8 hours each day for 3 days? But how many hours of watching in all?

Record your answers.

4. 6
   - $\times 6 =$?
   - $\times 7 =$?
   - $\times 8 =$?
   - $\times 9 =$?

5. 9
   - $\times 6 =$?
   - $\times 7 =$?
   - $\times 8 =$?
   - $\times 9 =$?

6. 8
   - $\times 6 =$?
   - $\times 7 =$?
   - $\times 8 =$?
   - $\times 9 =$?

7. 7
   - $\times 6 =$?
   - $\times 7 =$?
   - $\times 8 =$?
   - $\times 9 =$?

PROGRESS CHECK

Try these. See how well you do. Multiply.

(1.) 5×3	(2.) 1×1	(3.) 4×5	(4.) 3×1	(5.) 6×2	(6.) 5×7	(7.) 8×4
(8.) 9×5	(9.) 4×7	(10.) 7×6	(11.) 6×8	(12.) 9×6	(13.) 8×7	(14.) 9×9

Answer the questions.

(15.) 7 nickels in your pocket.
5 cents each.
How many cents is this?

(16.) 8 cookies on the tray.
8 trays of cookies.
How many cookies in all?

(17.) 8 girls in the club.
7 projects for each girl.
How many projects in all?

(18.) 8 boys in the club.
6 projects for each boy.
How many projects in all?

(19.) 9 blocks to the pool.
2 minutes to walk a block.
How many minutes of walking?

(20.) 7 pieces in one pack.
7 packs sold.
How many pieces sold in all?

(21.) 6 cars in each row.
7 rows of parked cars.
How many cars in all?

(22.) 9 hours of sleep each day.
7 days a week.
How many hours of sleep in all?

1. The label said 24 balls. It looks as if the bag has been opened. I had better make sure there are 24.
I can hold only 3 balls at a time. How many handfuls can I take out if there are 24?

You get a bag. Put 24 of any object in the bag. Take out 3 each time until the bag is empty. How many times do you take out a set of 3? If you took 4 each time, how many times would you have taken a handful? If you took 6 each time, how many times would you have taken a handful? If you took 8 each time, how many times would you have taken a handful?

How many?

2. Here's a carton that holds 12 eggs. I can see that there are only 2 rows. How many eggs should fit in each row?

How many?

3. This package of blocks is wrapped so that I can see only 4 blocks. The label says 24 blocks. How many blocks should there be in each of the 4 rows?

See 3 rows?
18 in all.
How many in each row?

2 in each row? $3 \times 2 = 6$ No.
4 in each row? $3 \times 4 = 12$ No.
5 in each row? $3 \times 5 = 15$ No, but it's closer.
6 in each row? $3 \times 6 = 18$ Yes.

Answer each question.

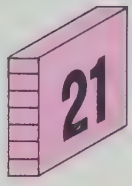
1.

5 rows.
20 in all.
How many in each row?
$5 \times \underline{?} = 20$

2.

6 rows.
48 in all.
How many in each row?
$6 \times \underline{?} = 48$

3.

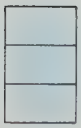


How many rows?
How many in all?
How many in each row?
Write the sentence.

4.

How many rows?
How many in all?
How many in each row?
Write the sentence.

5.



12 cubes in all.
3 stacked boxes.
$\underline{?}$ in each box.

6.

36 glasses in all.
4 stacked boxes.
$\underline{?}$ in each.

7.

30 things in all.
5 stacked boxes.
$\underline{?}$ in each box.

8.

54 in all.
6 stacked boxes.
$\underline{?}$ in each box.

Complete each sentence.

1. 36 buttons.
9 cards of buttons.
How many on each card?
$9 \times \underline{?} = 36$

2. 24 in all.
6 rows.
How many in each row?
$6 \times \underline{?} = 24$

3. 30 players.
6 on each team.
How many teams?
$\underline{?} \times 6 = 30$

4. 27 needed.
9 in each box.
How many boxes?
$\underline{?} \times 9 = 27$

5. 24 chairs.
8 rows.
How many in each row?
$8 \times \underline{?} = 24$

6. 32 want tickets.
4 ticket windows.
How many in each row?
$4 \times \underline{?} = 32$

7. 42 in all.
7 rows.
How many in each row?
$7 \times \underline{?} = 42$

8. 48 problems.
8 problems on each page.
How many pages?
$\underline{?} \times 8 = 48$

Write the number that should be in place of the ?.

9. $6 \times \underline{?} = 24$

10. $9 \times \underline{?} = 36$

11. $5 \times \underline{?} = 35$

12. $\underline{?} \times 8 = 24$

13. $\underline{?} \times 9 = 45$

14. $\underline{?} \times 6 = 18$

15. $9 \times \underline{?} = 18$

16. $6 \times \underline{?} = 36$

17. $8 \times \underline{?} = 32$

18. $7 \times \underline{?} = 63$

19. $\underline{?} \times 8 = 72$

20. $9 \times \underline{?} = 81$

Write the number that should be in place of the ?.

1. $6 \times \underline{?} = 42$ **2.** $7 \times \underline{?} = 35$ **3.** $8 \times \underline{?} = 48$ **4.** $\underline{?} \times 5 = 45$

5. $\underline{?} \times 3 = 24$ **6.** $7 \times \underline{?} = 42$ **7.** $8 \times \underline{?} = 56$ **8.** $9 \times \underline{?} = 72$

9. $\underline{?} \times 4 = 36$ **10.** $6 \times \underline{?} = 54$ **11.** $\underline{?} \times 7 = 49$ **12.** $\underline{?} \times 9 = 63$

13. Draw a picture to show each of the situations.

a There are 15 boxes in all.
Divide them equally for 3 people.
How many does each get?

b There are 18 pieces of pizza.
6 people are hungry.
Divide the pizza pieces equally.
How many does each get?

c There are 10 chicken legs. 5 people are coming for dinner. Divide equally.
How many for each?

d There are 16 quarters. 4 people need money.
Divide the quarters equally.
How many can each person get?

Too many words? Too much work to draw pictures? Let's use symbols.

$$16 \div 4 = ?$$

14. Go back to your first picture. Use symbols to show the situation.
What sentence can represent situation **b**? situation **c**?

15. Think carefully about this one. What sentence can represent
0 dollars being divided equally among 4 people?

Let's change from boxes to bags.

1. The label says 28.
Take out 7 at a time.
28 to start with.

Take away 7.	$28 - 7 = 21$
Take away 7 more.	$21 - 7 = 14$
Take away 7 more.	$14 - 7 = 7$
Take away 7 more.	$7 - 7 = 0$

None left in the bag.

How many times was 7 subtracted?
Does $4 \times 7 = 28$?

---

2. The label says 25¢.
Each piece should cost 5¢.
How many pieces?
You could subtract to find out.
25 to start with.

Take away 5.	$25 - 5 = 20$
Take away 5 more.	$20 - 5 = 15$
Take away 5 more.	$15 - 5 = 10$
Take away 5 more.	$10 - 5 = 5$
Take away 5 more.	$5 - 5 = 0$

How many times was 5 subtracted?
Does $5 \times 5 = 25$?

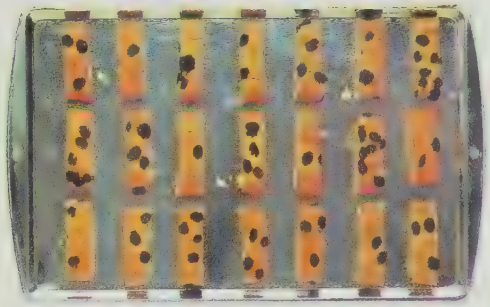
Is there a faster way to find the answer?

You can always subtract rather than divide.
Use subtraction to find this answer. ⟶

24 cookies.
6 in each row.
How many rows?

Multiplication is related to division too.

The multiplication sentence for this array is $3 \times 7 = \underline{?}$
This sentence would help you find how many in all.



Pretend now that you already know there are 21.
You know there are 3 rows.
But you don't know how many in each row.

You can use multiplication ⟶ $3 \times \underline{?} = 21$
or division ⟶ $21 \div 3 = \underline{?}$

Now pretend you know how many in each row.
But you don't know how many rows.

You can use multiplication ⟶ $\underline{?} \times 7 = 21$
or division ⟶ $21 \div 7 = \underline{?}$

$21 \div 3 = 7$ because $7 \times 3 = 21$ $\quad$ $21 \div 7 = 3$ because $3 \times 7 = 21$

Try some on your own.

	a	b
1.	$24 \div 8 = \underline{?}$ because $\underline{?} \times 8 = 24$	$32 \div 4 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$
2.	$45 \div 5 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$	$36 \div 6 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$
3.	$18 \div 2 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$	$27 \div 3 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$
4.	$54 \div 9 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$	$42 \div 7 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$
5.	$63 \div 7 = \underline{?}$ because $\underline{?} \times \underline{?} = \underline{?}$	$81 \div 9 = \underline{?}$ because $9 \times 9 = 81$

We need some math words to help us talk about multiplication and division.

$$3 \times 4 = 12$$

3 and 4 are called factors.
12 is called the product.

$$3 \times \underline{?} = 12$$

3 is the known factor. $\underline{?}$ is the unknown factor. 12 is still the product. We can use the same names when we think about division.

$$12 \div 4 = 3$$

12 is still the product.
3 and 4 are still factors.

$$12 \div 4 = \underline{?}$$

12 is the product.
4 is the known factor.
$\underline{?}$ is the unknown factor.

Look at part of the multiplication table.

×	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

3, 4, and 12 are marked.

How are these numbers related?

$$3 \times 4 = 12$$
$$4 \times 3 = 12$$
$$12 \div 3 = 4$$
$$12 \div 4 = 3$$

The factors are on the left side and across the top of the table.

1. Find 20.
   What are its factors?

2. Is 20 in more than one place in the table? Now what are the factors?

3. Find 8.
   Is there more than one?
   What are the factors?

4. Find 15.
   Is there more than one?
   What are the factors?

This table can help you with multiplication *and* division.

Find out how

Remember the multiplication facts for 9?
Write them in order on your paper.
Then use that set of facts to help you
complete a list of division facts for 9.

$1 \times 9 = 9$	$9 \div 9 = 1$
$2 \times 9 = 18$	$18 \div 9 = 2$
$3 \times 9 = 27$	$27 \div 9 = 3$

Start with the problems below and
complete each pattern of facts.

$54 \div 6 =$
$48 \div 6 =$
$42 \div 6 =$
$36 \div 6$
$30 \div$

$63 \div 7 =$
$56 \div 7 =$
$49 \div 7 =$
$42 \div 7$
$35 \div$

$72 \div 8 =$
$64 \div 8 =$
$56 \div 8 =$
$48 \div 8$
$40 \div$
32

To be really

FAST

you have to practise. Put your paper next to the first row. Write the answers. Fold the paper each time you finish a row.

1.	**2.**	**3.**
$27 \div 3$	$36 \div 4$	$45 \div 5$
$24 \div 3$	$32 \div 4$	$40 \div 5$
$21 \div 3$	$28 \div 4$	$35 \div 5$
$18 \div 3$	$24 \div 4$	$30 \div 5$
$15 \div 3$	$20 \div 4$	$25 \div 5$
$12 \div 3$	$16 \div 4$	$20 \div 5$
$9 \div 3$	$12 \div 4$	$15 \div 5$
$6 \div 3$	$8 \div 4$	$10 \div 5$
$3 \div 3$	$4 \div 4$	$5 \div 5$

Patterns can sometimes help you. Once in a while they can hurt you. You can't be sure of your speed and accuracy using division until you "mix up" the combinations listed above.

Here are some people problems. Give each person an equal number.

4. 24 cookies.
4 people want some.
How many cookies for each?

5. 28 free tickets.
4 people want some.
How many tickets for each?

6. 35 pennies.
5 people want some.
How many pennies for each?

7. 21 sour balls.
3 people want some.
How many sour balls for each?

8. 12 sticks of gum.
3 people want some.
How many sticks for each?

9. 40 marbles.
5 people want some.
How many marbles for each?

There are no patterns here. Find the answers.
Let the multiplication facts help you now.
Use the folded-paper idea to save time.

1.	2.	3.	4.	5.
$1 \div 1$	$32 \div 8$	$45 \div 9$	$9 \div 9$	$25 \div 5$
$63 \div 7$	$4 \div 2$	$42 \div 6$	$56 \div 8$	$24 \div 8$
$72 \div 9$	$56 \div 7$	$64 \div 8$	$42 \div 7$	$9 \div 9$
$7 \div 7$	$36 \div 6$	$49 \div 7$	$36 \div 6$	$54 \div 6$
$48 \div 6$	$25 \div 5$	$72 \div 8$	$63 \div 9$	$30 \div 6$
$40 \div 5$	$18 \div 9$	$14 \div 7$	$16 \div 8$	$20 \div 5$
$49 \div 7$	$48 \div 8$	$54 \div 9$	$35 \div 7$	$45 \div 5$
$30 \div 5$	$35 \div 5$	$6 \div 6$	$12 \div 6$	$15 \div 5$
$10 \div 5$	$15 \div 5$	$21 \div 7$	$27 \div 9$	$28 \div 7$
$0 \div 9$	$81 \div 9$	$40 \div 8$	$8 \div 8$	$5 \div 5$

Find the number that should replace each ?

6. **12**
$\div 3 = ?$
$\div 4 = ?$
$\div 6 = ?$
$\div 2 = ?$

7. **18**
$\div 2 = ?$
$\div 6 = ?$
$\div 3 = ?$
$\div 9 = ?$

8. **24**
$\div 6 = ?$
$\div 8 = ?$
$\div 4 = ?$
$\div 3 = ?$

PROGRESS CHECK

Divide

Part 1	Part 2	Part 3	Part 4
$8 \div 4$	$30 \div 5$	$30 \div 6$	$72 \div 8$
$20 \div 5$	$18 \div 3$	$18 \div 2$	$63 \div 7$
$15 \div 3$	$24 \div 8$	$24 \div 4$	$54 \div 9$
$12 \div 4$	$18 \div 9$	$36 \div 9$	$48 \div 6$
$6 \div 2$	$35 \div 7$	$21 \div 7$	$63 \div 9$
$12 \div 3$	$28 \div 4$	$35 \div 5$	$49 \div 7$
$10 \div 5$	$27 \div 9$	$27 \div 3$	$54 \div 6$
$16 \div 4$	$40 \div 8$	$28 \div 7$	$42 \div 7$
$15 \div 5$	$24 \div 6$	$45 \div 9$	$56 \div 8$
$25 \div 5$	$32 \div 4$	$32 \div 4$	$72 \div 9$

5
40 in all.
5 in each car.
How many cars?

6
42 in all.
6 in each box.
How many boxes?

7
32 in all.
8 at each table.
How many tables?

8
63 in all.
7 in each set.
How many sets?

A doctor makes a diagnosis when he tries to find out how to make a person feel better.

The last page was a diagnosis of the division facts. You might need more practice to compute better.

Get or make a complete multiplication table.

Only part of the table is pictured below.
Look at your errors on the last page.
Can you locate the fact in the table?

×	1	2	3	4	5	6	7	8	9
1	1	2	3	4	5				
2	2	4	6	8	10				
3	3	6	9	12	15				
4	4	8	12	16	20				
5	5	10	15	20	25				
6									
7									
8									
9									

Part 1 facts come from here.

Part 2 and Part 3 facts come from here.

Part 2 and Part 3 facts come from here.

Part 4 facts come from here.

Maybe the diagnosis can help you decide what facts you have to study the most.

We have ignored an important number.

The number 0 tells how many.

Bill is broke. He has no money at all. *How many* cents does Bill have?
The cookie jar was empty. *How many* cookies in the cookie jar?
She didn't make any mistakes. *How many* mistakes did she make?

1. He had 0.
She had 3.
How many in all?

2. She had 0.
She lost 0.
How many remain?

3. Mr. Billings promised to put money in each of his children's banks. His promise was to put enough money in to make the amount three times as much. Here's what each child thought.

a You compute the new amount in each bank.

Earl thought $3 \times \$2 = \underline{?}$

Jean thought $3 \times \$0.50 = \underline{?}$

Jerry thought $3 \times \$3.50 = \underline{?}$

b Murl's bank was empty. Write the multiplication sentence that tells what Murl thought.

c How much did Mr. Billings put in Murl's bank?

4. The prizes were planned as a joke. There were 3 bags. Each bag was empty. The winner was to get the prizes in two of the bags. The runner-up got the prizes in the other bag. The winner opened his bags and caught on to the joke. The winner said to the runner-up, "Oh boy! I got twice as many prizes as you did." How many prizes did each get? Did the winner get twice as many?

Compute. Replace the ? with the correct whole number.
It might help to think of a story with a paper bag.
Or maybe thinking about the number line would help.

1.
$2 + 0 = ?$
$0 + 9 = ?$
$10 + 0 = ?$
$0 + 2 = ?$

2.
$2 - 0 = ?$
$0 - 9 = ?$
$10 - 0 = ?$
$0 - 2 = ?$

3.
$2 \times 0 = ?$
$0 \times 9 = ?$
$10 \times 0 = ?$
$0 \times 2 = ?$

What about the number 1? That's an important number also.

4.
$2 + 1 = ?$
$1 + 9 = ?$
$10 + 1 = ?$
$0 + 1 = ?$

5.
$2 - 1 = ?$
$1 - 1 = ?$
$10 - 1 = ?$
$5 - 1 = ?$

6.
$2 \times 1 = ?$
$1 \times 9 = ?$
$10 \times 1 = ?$
$0 \times 1 = ?$

7.
$9 \div 1 = ?$
$1 \div 1 = ?$
$4 \div 1 = ?$
$10 \div 1 = ?$

Compute. WATCH OUT!

You might have to add or subtract or multiply.

8.
$0 + 0 = ?$
$0 \times 0 = ?$
$1 \times 0 = ?$
$0 \times 1 = ?$
$0 + 1 = ?$
$1 + 1 = ?$
$1 - 0 = ?$

9.
$5 \times 0 = ?$
$1 + 3 = ?$
$3 - 1 = ?$
$0 \times 3 = ?$
$4 + 1 = ?$
$5 - 1 = ?$
$3 - 0 = ?$

10.
$5 + 1 = ?$
$4 - 0 = ?$
$3 + 1 = ?$
$0 \times 4 = ?$
$1 + 4 = ?$
$4 - 1 = ?$
$3 \times 0 = ?$

11. What would happen if everybody had forgotten about zero? What changes would we have to make if we didn't have that number at all?

CHECKOUT

Multiply.

	a	b	c	d	e	f
1.	5 × 6	8 × 4	9 × 7	6 × 3	7 × 4	8 × 8
2.	2 × 8	9 × 9	8 × 6	4 × 3	5 × 4	7 × 6

Divide.

	a	b	c	d
3.	42 ÷ 7 = ?	36 ÷ 4 = ?	21 ÷ 7 = ?	54 ÷ 9 = ?
4.	56 ÷ 7 = ?	27 ÷ 3 = ?	25 ÷ 5 = ?	63 ÷ 9 = ?
5.	54 ÷ 6 = ?	35 ÷ 5 = ?	36 ÷ 9 = ?	24 ÷ 3 = ?

6. **a** 6 oaks, 6 elms, 6 maples, 6 pines, 6 poplars. How many?

   b 7 pears, 7 plums, 7 peaches, 7 bananas. How many?

   c 9 baskets, 9 bags, 9 boxes, 9 cages. How many?

7. **a** 36 runners in a relay race. There are 4 runners to a team. How many teams of runners?

   b $48 was earned. 6 people helped earn it. How much should each person get?

   c 27 fish were caught. 3 people shared the catch. How many fish for each person?

4

MEASUREMENT

How long is long?

"I've come a long way," said the man getting out of the car.
said the boy getting off the bike.
said the lady getting off the jet plane.
said the astronaut returning to earth.

How high is high?

"That's high!" said the man looking at Mount Everest.
said the boy looking at the fence.
said the little girl stacking building blocks.
said the lady looking up at the skydiver.

How far is far?

"That's far away," said the man looking at the mountaintop.
said the boy running to catch a fly ball.
said the girl looking up at a star in the sky.
said the person who needed eyeglasses.

YOUR GOAL is to be able to measure how long, how high, and how far.

1. What measuring devices can be used to measure length? What are their units of measure?

2. Could every length be measured with the same unit of measure? Would that make sense?

3. If I say its length is 1 and you say its length is 100, could we both be right? What other information do we need?

How long? How high? How far?

These are all questions about length.

To answer these questions, you must measure.

BUT before you measure—
Are you sure you know what you're going to measure?

What unit of measure should you use?
(Would you measure the distance from home to school with a metrestick?)

After you have answered these questions, you can measure.
Sometimes your measurement must be very accurate.
Sometimes a rough estimate will do.
Often you will have to compute.

Think of some distances to measure—
some long and some short.

1. From home to school—
   - **a** What large unit of measure could be used? Guess how many.
   - **b** What small unit of measure? Guess how many.

2. From floor to top of desk—
   - **a** What large unit of measure could be used? Guess how many.
   - **b** What small unit of measure? Guess how many.

3. Compute.

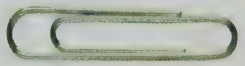
   a
   $$\begin{array}{rr} 4\text{ m} & 8\text{ cm} \\ +\ 3\text{ m} & 2\text{ cm} \\ \hline \end{array}$$

   b
   $$\begin{array}{rr} 2\text{ km} & 4\text{ m} \\ -\ 1\text{ km} & 1\text{ m} \\ \hline \end{array}$$

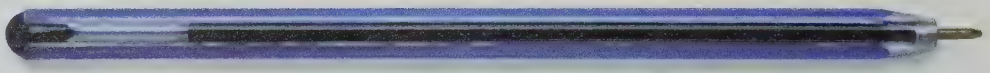
   c
   $$\begin{array}{rr} 1\text{ m} & \\ +\ & 1\text{ cm} \\ \hline \end{array}$$

This rule has centimetres marked on it.
What is the length of this rule?

About how long is the paperclip?

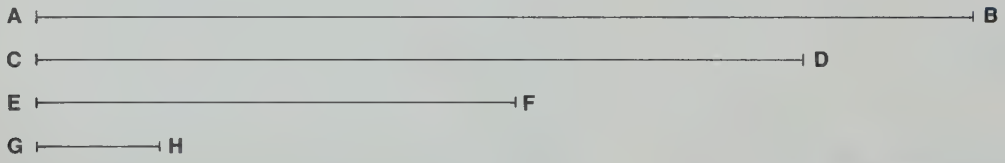


About how long is the pen?

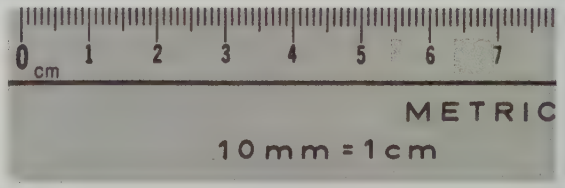


Look below.

1. Is line segment AB closer to 13 cm or 14 cm?
2. Is line segment CD closer to 11 cm or 12 cm?
3. Is line segment EF closer to 7 cm or 8 cm?
4. Is line segment GH closer to 1 cm or 2 cm?



There are lots of marks between the numbers on this rule.
Do you know what they show?



5. They show millimetres. How many millimetres are there in 1 cm? (Count them.)
   1 cm = ? mm
6. How many millimetres are there in 2 cm? in 5 cm?

Measure your handspan in centimetres on this rule.

Measure the width of 2 fingers in centimetres.

Knowing the length of your handspan and the width of 2 fingers can be useful.
Imagine you don't have a rule and you want to measure something. You could use your handspan or your two fingers. This would give you a rough estimate.
Try it.

1. Estimate the width of your desk.

object	estimate
width of desk	.... cm

2. Now measure it with a rule.

object	estimate	measure
width of desk	.... cm	.... cm

3. What is the difference between your estimate and your measurement with a rule?

object	estimate	measure	difference
width of desk	.... cm	.... cm	.... cm

4. Try these. See how close you can make your estimates.
(Pick some objects of your own choice to add to the list.)

pencil			
shoe length			
height of desk			

How long is your rule? What units are marked on it?

There are lots of different kinds of rules. Some may be 20 cm long. Some may be 40 cm long. Have you ever seen one that is 1 m long? (Look at the rules in the picture.)

A rule that is 1 metre long is called a metrestick.

$$100 \text{ cm} = 1 \text{ m}$$

So a metrestick is 100 cm long.

What's the longest measuring tape you have ever seen? When might you use a measuring tape rather than a metrestick or a rule? Why?

1. Get a rule that is marked in centimetres.

- **a** Is your foot one metre long?
- **b** About how many centimetres is it?
- **c** About how many centimetres long is your hand?
- **d** How wide is your hand?
- **e** Which is longer, your hand or your foot? By how many centimetres is it longer?

2. Which of the measurements below do you think would be about right for the things in the box?

6 m	**a**	a tall building
3 mm	**b**	your height
100 m	**c**	the length of a car
130 cm	**d**	the length of a fly's wing
1 mm	**e**	your middle finger
7 cm	**f**	the thickness of a piece of wire

1. How many millimetres are there in a centimetre?

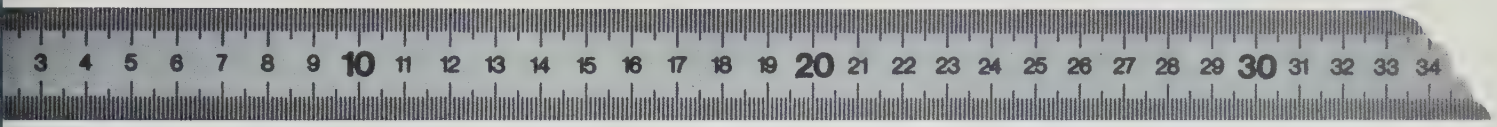
2. How many centimetres are there in a metre?

3. You may need to look at a metrestick to help you with this one. How many millimetres are there in a metre?

4. Copy and complete these tables:

cm	mm
1	10
2	?
3	?
?	50
?	70
10	?
100	?

m	cm
1	100
2	?
?	300
?	500
7	?
10	?
100	?



5. Measure 6 different things. (Don't pick things longer than your arm.) Measure two of them in centimetres. Measure two of them in millimetres. Measure two of them in centimetres first and then in millimetres. Make a table like this one to record your work.

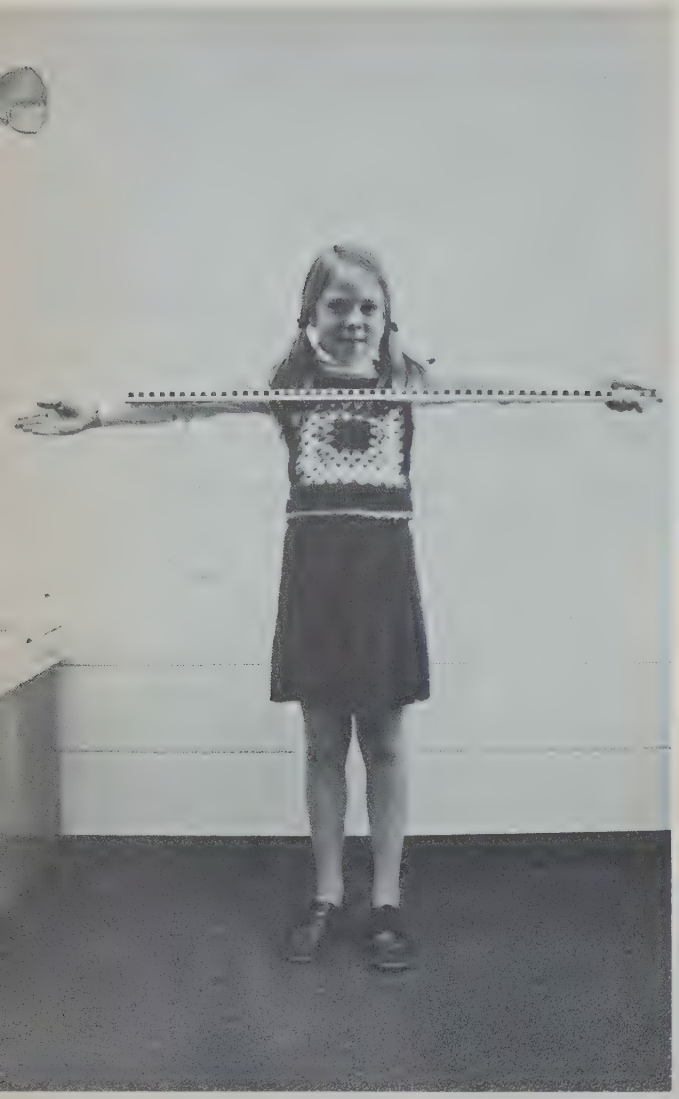
thing	cm	mm

6. Was it easier to use one unit of measure than the other?

7. When you measured two things first in centimetres and then in millimetres were the measurements equal?

8. Which unit (centimetres or millimetres) lets you measure more closely?

9. Measure 4 more things. You decide if you should measure them in centimetres or in millimetres. (If you have run out of ideas, here are a few: the width of a book; a finger nail; the length of your thumb; the width of your belt . . .)



Try estimating some distances in metres.
When you were estimating in centimetres you used handspans and finger widths to help you. What can you use to help you estimate in metres?

Try an arm length as a metre estimate (to the next shoulder or elbow). Try a long pace. Try a double pace.

Practise first. If you are going to practise paces you could do it by measuring off 10 m with a metrestick on the floor. Mark off the metres on the floor with tape. Practise your paces between these marks.

1. Do the measurements in the table below. Estimate first. Then measure. Then work out the difference between your estimate and your measurement. (Copy the table to keep a record of your work.)

Distance	Estimate in m	Measure in m	Difference in m
length of classroom			
width of classroom			
height of door			

Pick three more distances of your own. Add them to the table. Complete the table.

2. Can you always use paces to estimate?

3. When is it easy to make estimates in arm lengths?

1. Measure the distance around your school. How many times do you have to walk around your school to walk 1000 m?

2. A kilometre is a unit for measuring long distances.

   1 km = 1000 m

   Can you imagine a distance of 1000 m down the road? If you can, that will give you an idea of how long 1 km is.

   When would you use kilometres as a unit of measure?

3. One of the tallest buildings in the world is about 550 m high. Is it more or less than 1 km high? How many metres is it more or less than 1 km?

4. The highest mountain in the world is Mount Everest. It is 8840 m high. About how many kilometres high is it?

5. One of the biggest steel arch bridges in the world is the Sydney Harbour Bridge in Australia. It is about 1150 m long. Is it longer or shorter than 1 km? How many metres longer or shorter is it than 1 km?

6. The Bernstein family went on a three-day trip. The first day they drove 150 km to town A. The second day they drove 68 km to town B. The third day they drove 42 km to town C. They then drove 140 km back to their home town. How many kilometres did they travel on the whole trip?

Can you write the numbers from one to ten so that someone who spoke only Spanish or Greek or Russian would understand them?

Yes, you can. Like this:

1 2 3 4 5 6 7 8 9 10

These are symbols. They are not part of any language. Over most of the world they are written in the same way. It is easier and faster to write symbols than words.

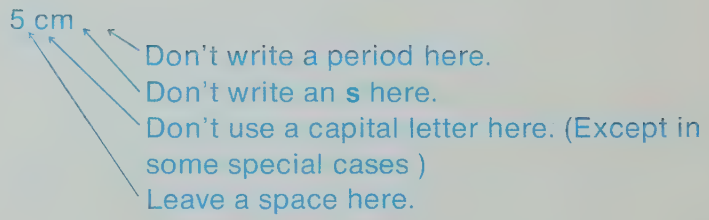
We use symbols for our units of measurement as well. These symbols are also the same all over the world.

The symbol **cm** is the easy way to write the word centimetre.

To write five centimetres in symbols you would write:

5 cm

People all over the world have agreed to use the same rules when they write the measurement symbols. These rules are part of the International System of Units. Here are some of the rules.


5 cm
Don't write a period here.
Don't write an **s** here.
Don't use a capital letter here. (Except in some special cases)
Leave a space here.

1. Can you spot the mistakes? (Watch out! Some have more than one mistake.)

a 4 Km **b** 15cm. **c** 34 cm.
d 6 mm **e** 85 cms. **f** 13 kms

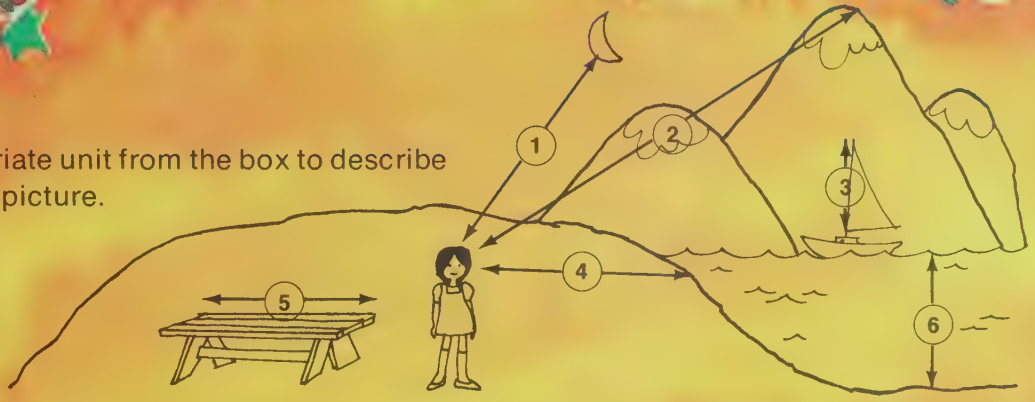
2. Write these in symbols:

a six centimetres **b** fourteen metres **c** eight kilometres
d nine millimetres **e** four millilitres **f** three grams
g one hundred fifty-nine kilograms

You may refer to the table on the last page of this book if you wish.

PROGRESS CHECK

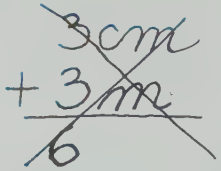
Select an appropriate unit from the box to describe the lengths in the picture.



kilometres, metres, centimetres, millimetres

1. distance from girl to moon
2. distance from girl to mountain
3. height of sail
4. distance from girl to lakeshore
5. length of picnic table
6. depth of lake
7. height of girl
8. width of boat
9. height of mountain
10. length of girl's shoes
11. length of boat
12. length of girl's hair

You can add, subtract, multiply, or divide measurements with no trouble IF you remember one thing. Only like measurements can be computed. Look at some examples:



3 cm + 3 m is of course 3 m 3 cm .

One length of rope was 6 m . Another was 9 m . How much rope in all?

$$\begin{array}{r} 6\text{ m} \\ +\ 9\text{ m} \\ \hline 15\text{ m} \end{array}$$

One length of rope was 1 m 40 cm and another was 1 m . How much rope in all?

$$\begin{array}{r} 1\text{ m }40\text{ cm} \\ +\ 1\text{ m} \\ \hline 2\text{ m }40\text{ cm} \end{array}$$

2 m 40 cm ← total number of cm
↑ total number of m

The same thing holds for subtraction. For example: One rope was 2 m 60 cm long. The other was 1 m 10 cm long. How much longer was the first piece of rope?

$$\begin{array}{r} 2\text{ m }60\text{ cm} \\ -\ 1\text{ m }10\text{ cm} \\ \hline 1\text{ m }50\text{ cm} \end{array}$$

1 m 50 cm ← the difference in cm
↑ the difference in m

The computation you will be working with is not tricky or hard. Just remember to add or subtract like measurements. Try these. Watch the operation signs.

1. $\begin{array}{r} 1\text{ m }10\text{ cm} \\ +\ 1\text{ m }\ 8\text{ cm} \\ \hline \end{array}$ **2.** $\begin{array}{r} 3\text{ m }55\text{ cm} \\ +\ 1\text{ m }40\text{ cm} \\ \hline \end{array}$ **3.** $\begin{array}{r} 4\text{ m }10\text{ cm} \\ -\ 1\text{ m }\ 8\text{ cm} \\ \hline \end{array}$ **4.** $\begin{array}{r} 3\text{ m }45\text{ cm} \\ -\ 1\text{ m }20\text{ cm} \\ \hline \end{array}$

ARE YOU READY FOR SOMETHING NEW?

You know about money.
We write sums of money like this — $1.45

This is the dollar sign.
This is the number of dollars.
This is called the decimal point.
This is the number of cents.

1. How many dollars? How many cents?

a $2.75 **b** $16.50 **c** $1.05 **d** $3.10 **e** $0.06

We use the decimal point in writing measurements too. 1.45 m

This is the number of metres.
This is the decimal point.
This is the number of centimetres.

2. How many metres? How many centimetres?

a 2.75 m **b** 16.50 m **c** 1.05 m **d** 3.10 m **e** 0.06 m

We can write 5 m 27 cm in metres, using the decimal point and symbol m .
5 m 27 cm = 5.27 m

3. Write these with a decimal point and the symbol m .

a 3 m 55 cm **b** 1 m 20 cm **c** 5 m 75 cm **d** 1 m 18 cm

Sports records are being broken every year.

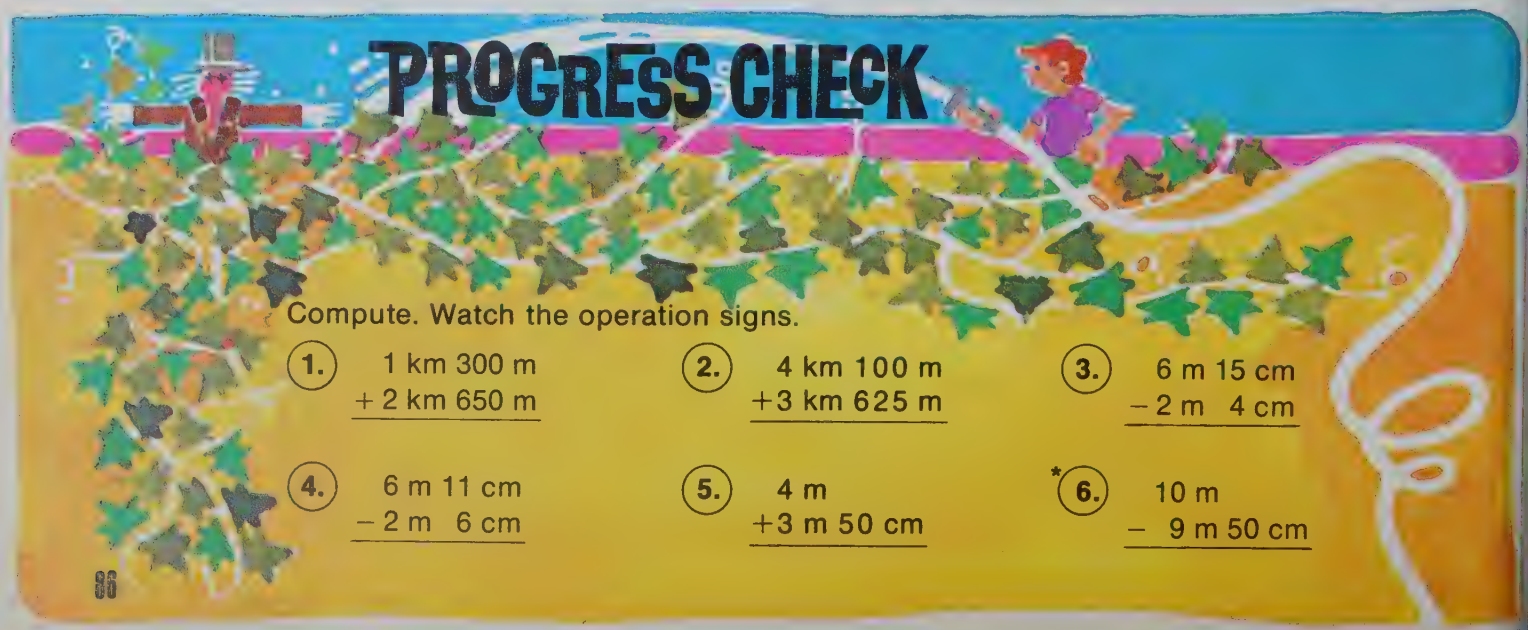
1. A really good athlete can throw a discus 57 m or more. But the world's record for the discus throw is about 67 m . What is the difference between the distances?

2. A recent record for the javelin throw was 79 m . The world's record is over 92 m . What is the difference between the two distances?

3. Fishing is a sport too.

   a Suppose you caught a fish 69 cm long. The longest ones grow to 75 cm . What's the difference?

   b You would probably have your picture taken if you caught a brook trout 50 cm long. The record is 80 cm long. What's the difference?


PROGRESS CHECK
Compute. Watch the operation signs.
1. 1 km 300 m + 2 km 650 m
2. 4 km 100 m + 3 km 625 m
3. 6 m 15 cm − 2 m 4 cm
4. 6 m 11 cm − 2 m 6 cm
5. 4 m + 3 m 50 cm
*6. 10 m − 9 m 50 cm

Just for fun

All the underlined words have something to do with time. You will know some of these words. Others may be new.

What period of time does each phrase refer to?

1. fourscore and seven years ago
2. fortnightly dances
3. a centennial celebration
4. a bicentennial celebration
5. a silver anniversary
6. a golden anniversary
7. a quarterly magazine
8. an annual affair
9. a semiannual affair
10. biennial election
11. a perennial favorite
12. just a second
13. wait a minute
14. in a moment
15. an hour ago

Make up a story. See how many of these time words you can use.

When you want to go somewhere and you have to wait for someone to take you, does time seem to go slowly?

When you're really having a good time and you have to be home at 9:00, does time seem to go fast?

Does time seem to go slowly when you have to do something you don't like to do?

Does summer seem to go faster than winter? day faster than night?

Will there be a 9:00 tomorrow? the next day? the day after that? and the day after that?

What makes 10:00 in the morning different from 10:00 at night?

1. Must we have clocks for telling time?

   a A farmer can tell about what time it is by the length of the shadow he casts. (BUT that's only if the sun shines.)

   b A waitress can tell about what time it is according to how many people there are to be served. (BUT that's only on days that she works.)

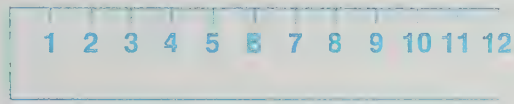
   c A child can tell about what time it is by the TV programs that are on. (BUT that's only if the TV is working.)

2. Do all clocks look the same?

3. Do all clocks measure the same thing?

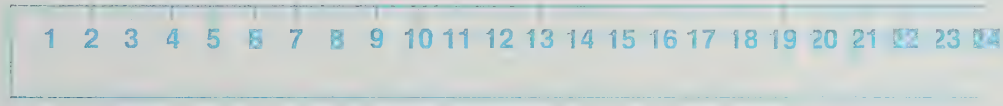
The earth turns. The turning earth also moves around the sun. We have night and day and we have a year because of the earth's turning.

It takes 12 months for the earth to go round the sun,



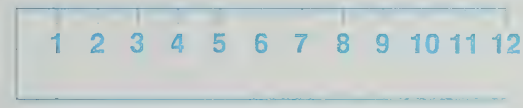
and here we start round the sun again.

It takes 24 hours for the earth to make one complete turn on its axis,



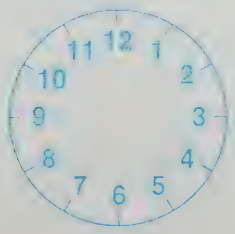
and here we start round again.

We have on the average 12 hours of day and 12 hours of night.



and here $\frac{1}{2}$ of the day is over and we start into the next $\frac{1}{2}$. When that's over we start again into the next day.

Since hours go on and on, one into the other, we bend the number line.



From 12:00 midnight to 12:00 noon, the hour hand of the clock completes one turn.

From 12:00 noon to 12:00 midnight, the hour hand completes another turn.

It's probably not a surprise
that the number of minutes in one hour
is some number times 12.

When the minute hand makes one complete turn, 60 minutes, or 1 hour, have passed.

Now guess how many seconds in one minute? The clock is neat and tidy. Go back to the picture. Imagine a second hand sweeping around that same curved number line. When it makes one complete turn, 60 seconds, or 1 minute, have passed and the next minute begins.

1. How many hours are there in 1 day?
   Is it always the same number?

2. How many days are there in 1 week?
   Is it always the same number?

3. How many days are there in 1 month?
   Is it always the same number?

4. How many weeks are there in 1 month?
   Is this number exact?

5. How many days are there in 1 year?
   in 1 leap year?

6. How many weeks are there in 1 year?
   How many days are left over?

7. How many months are there in 1 year?
   Is it always the same number?

*8. How many years are there in 1 decade?
   Is it always the same number?

*9. How many years are there in 1 century?
   Is it always the same number?

Copy and complete these tables.

1.

hours	minutes
1	60
2	?
5	?
12	?
24	?

2.

minutes	seconds
1	60
2	?
5	?
10	?
60	?

3.

days	hours
1	24
2	?
3	?
7	?
10	?

4.

days	weeks
7	1
14	?
?	9
?	36

5.

months	weeks
1	?
3	?
6	?
12	?

6.

months	years
12	?
?	2
120	?
?	12

7. Get a clock or a watch that has a second hand. Watch the second hand as it moves around. When it gets to the 12 mark, start tapping with your foot. Tap your foot each time the second hand passes one of the marks on the rim. The time it takes for the second hand to get back to the 12 mark is *one minute* (min).

8. How many seconds does it take you to do each of these things? Get a friend to time you.

a Count from 1 to 50.

b Compute 1344 + 973.

c Walk the length of a city block.

d Run the length of a city block.

9. How many seconds does it take your friend to do these things?

10. Can you tell how long 10 seconds is without a clock or a watch? Get a friend to time you. How close did you come?

We use symbols for units of time, too.

hour	h
minute	min
second	s

1. Mary took 6 min 52 s to do this page of mathematics. John took 6 min 21 s . Who took longer? How much longer?

2. It is now 1:20 in the afternoon. School is out at 3:20. How long is it until school is out?

3. A chess clock shows how much time each player has spent making his moves. Rod has used 1 h 34 min . Lynn has used 1 h 49 min . How long has the game lasted? How much more time has Lynn used than Rod?

4. In a relay race Hilda took 53 s . Virginia took 46 s . Anne took 48 s . How many seconds did the three girls take in all? The other team took 15 s more. How much time did the other team take?

5. Tad ran 500 m in 2 min 3 s . Bill ran it in 3 min 7 s . How much longer did Bill take?

6. How many hours is it from breakfast to lunch? from lunch to dinner? from dinner to the next day's breakfast?

7. A sign on the barber's door reads "Back in 60 minutes." What is the least amount of time you would expect to wait? What is the longest time you would expect to wait?

BUS SCHEDULE

WESTBOUND					EASTBOUND				
OLD TOWN	6:05	11:35	3:50	8:20	RIVERPORT	6:45	11:30	4:00	8:15
EAST BUTTON	6:55	12:25	4:40	9:10	CHANCE	7:10	11:55	4:25	8:40
DIXIEVILLE	7:30	1:00	5:15	9:45	DIXIEVILLE	7:30	12:15	4:45	9:00
CHANCE	7:50	1:20	5:35	10:05	EAST BUTTON	8:05	12:50	5:20	9:35
RIVERPORT	8:15	1:45	6:00	10:30	OLD TOWN	8:55	1:40	6:10	10:25

1. What time does the first bus leave Old Town going west? When does it reach Riverport? How long does it take?
2. What time does the last bus leave Riverport going east? When does it reach Old Town? How long does it take? Does it take the same length of time as the westbound bus?
3. Do all the westbound buses take the same amount of time? Do all the eastbound buses take the same amount of time?
4. Why are some times in the schedule printed in different type?
5. How long does it take to go from Old Town to East Button? from East Button to Dixieville? from Dixieville to Chance? from Chance to Riverport?
6. How long does it take to go from Chance to East Button? from Chance to Old Town? from Riverport to Dixieville?

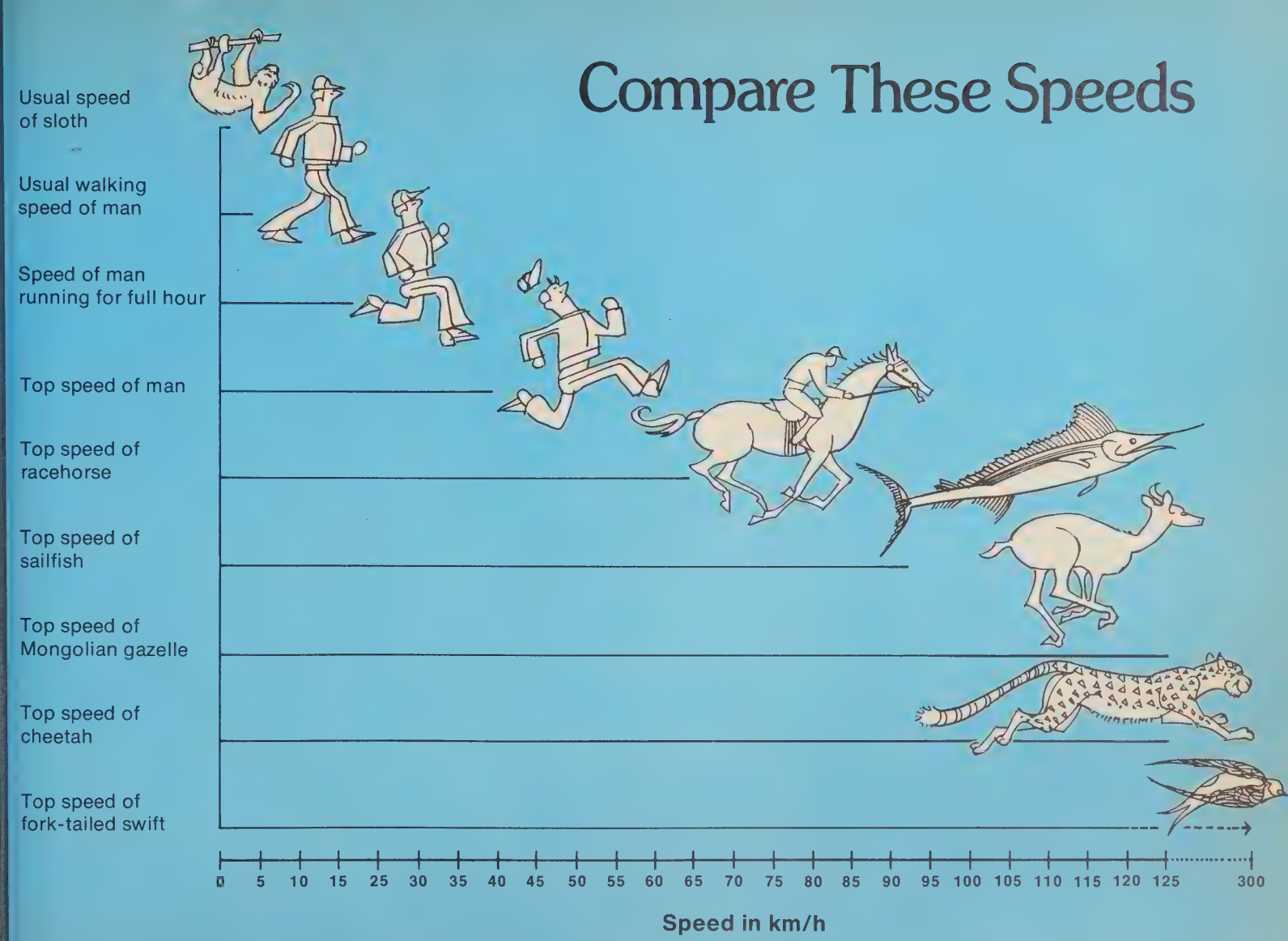
1. If you were driving at a speed of 100 kilometres per hour, how far would you get in 1 hour?
2. At the same speed, how far would you get in:
   a 2 h? **b** 5 h? **c** 8 h?
3. We use the symbol **km/h** to stand for kilometres per hour. What part of the symbol stands for the word **per**? What part stands for the word **hour**?
4. At a speed of 75 km/h, how far would you get in:
   a 1 h? **b** 2 h? **c** 4 h?
5. What is the usual speed limit, in km/h, in the city? outside the city?
6. Speed can be measured in other units as well. The speed of light is about 300 000 km/s . What do you think the symbol **km/s** stands for?
7. If you were able to jump on a beam of light, how far would it carry you in 10 s?
8. The fastest land animal in the world is the cheetah. Look at the chart. How fast can it go? Do you think it can run at that speed all day? About how long do you think it could run at that speed?
9. How many animals on the chart are faster than a man?
10. What is the difference between your top speed and the speed you can keep up for a full hour?

Work out your own top speed when you get a chance. Get a friend to help you. Measure off 50 m on the playground. Have someone time you, in seconds, while you run 50 m . Use the chart below to find out what your speed is in km/h .

Number of seconds to run 50 m	*5	6	7	8	9	10	11	12	13	14	15	16
Speed in km/h	36	30	26	23	20	18	16	15	14	13	12	11

*This is about the same speed as a world record would be.

Compare These Speeds


Usual speed of sloth
Usual walking speed of man
Speed of man running for full hour
Top speed of man
Top speed of racehorse
Top speed of sailfish
Top speed of Mongolian gazelle
Top speed of cheetah
Top speed of fork-tailed swift
0 5 10 15 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 300
Speed in km/h

CHECKOUT

1. Which of the measurements fits

a	the width of an ant's head?	28 cm
b	the length of a cat's tail?	4 m
c	the height of a giraffe?	1 mm

2. List in order from shortest to longest unit of time.

minute, day, second, year, week, hour

3. Compute. Watch the operation signs.

a
$$\begin{array}{r} 3\text{ m }24\text{ cm} \\ +\,1\text{ m }59\text{ cm} \\ \hline \end{array}$$

b
$$\begin{array}{r} 8\text{ m }48\text{ cm} \\ -\,3\text{ m }35\text{ cm} \\ \hline \end{array}$$

c
$$\begin{array}{r} 8\text{ km }100\text{ m} \\ -\,7\text{ km} \\ \hline \end{array}$$

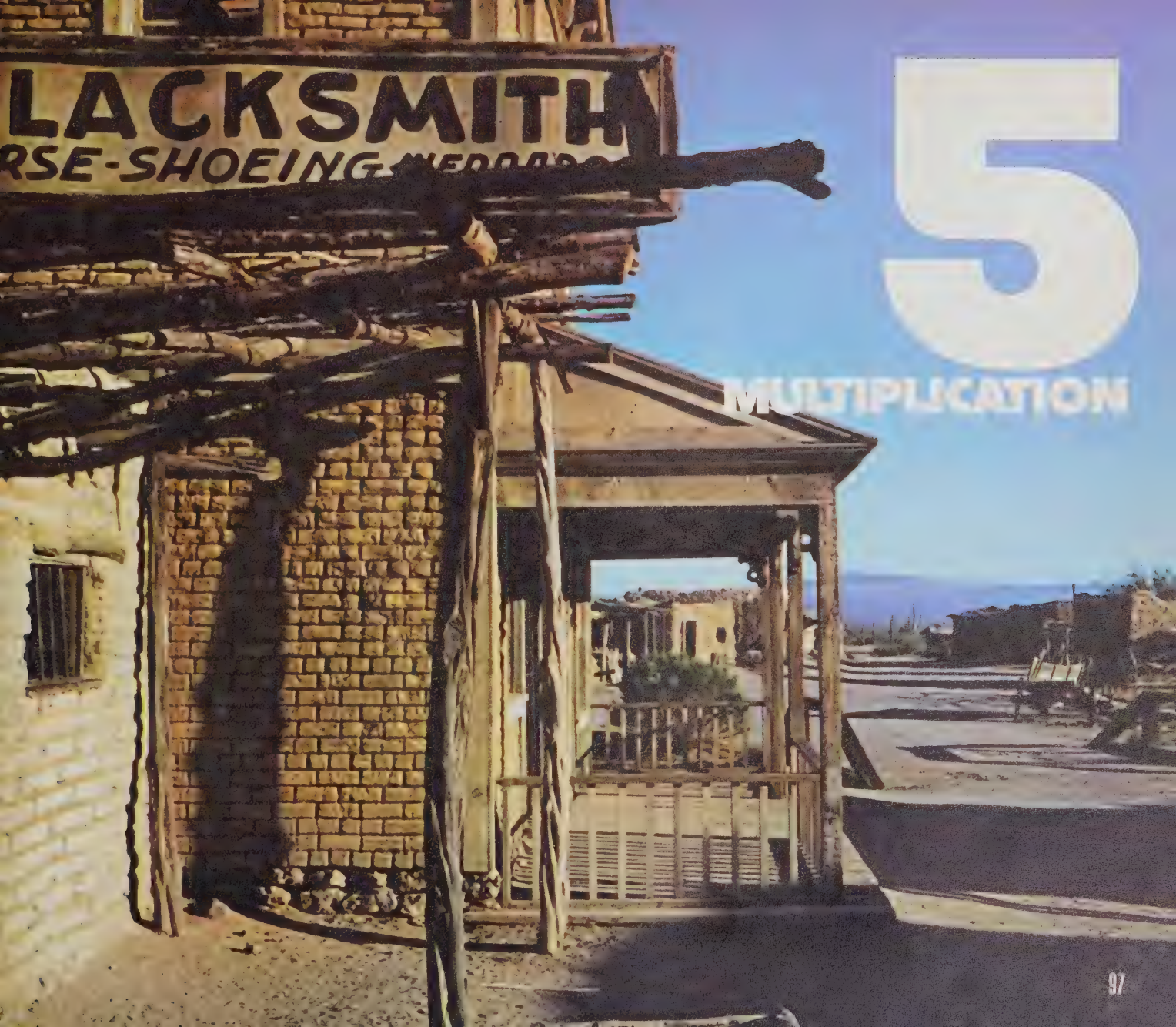
4. How many minutes in 2 h?

5. How far can you travel in 3 h if you are going at 50 km/h?

6. How many centimetres in 5 m?

7. How many days in 9 weeks?

8. Write the symbols for
a kilometre **b** gram **c** millimetre



5

MULTIPLICATION

Dirty Dan has been panning for gold. Now he is on his way to Paydirt City to get dollars for his gold. It is a long, dangerous road. Can you help him past the dangers he meets?

If you're lucky, you will find a treasure in the next pages. You'll find the valuable skill of multiplication. That's your

GOAL

This is part of an assayer's chart.
Copy and complete it.

Grams of gold

Dollar value of gold	1	2	3	4	5	6	7	8	9	10
5	5	10								
6										
7				28						
8										
9										
10										

Can you guess what it was used for?

1. Dan visited the General Store in Paydirt City. There were many kinds of goods on the shelves. The picture below shows an easy way to count each type of item. Can you figure out the system?

2. Two bottles of castor oil are gone. How many are still on the shelf? There are no boxes of candles gone from the middle shelf. How many candles are on the shelf?

1. How many in all if 1 row had 10 objects?
2. How many in all if 2 rows had 10 objects in each row?
3. How many in all if 4 rows had 10 objects in each row?
4. How many in all if 6 rows had 10 objects in each row?
5. How many in all if 7 rows had 10 objects in each row?

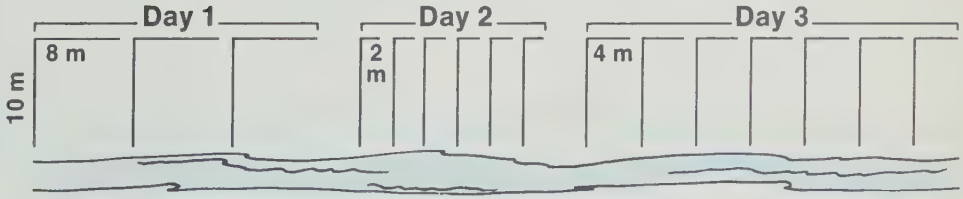
Each of your answers is a multiple of 10. The number ten was used as a factor in each problem. The system for filling the shelves in the old grocery store used this idea. Each row was to have ten items. The number of rows × 10 would tell you how many in all.

Here are some problems involving multiples of 10. Find the answers.

6. 10 boxes of salt in a row.
   3 complete rows.
   ? boxes of salt in all.
7. 10 sacks of beans in a row.
   5 complete rows.
   ? sacks of beans in all.
8. 10 bags of sugar in a row.
   8 complete rows.
   ? bags of sugar in all.
9. 10 cans of lye in a row.
   4 complete rows.
   ? cans of lye in all.
10. 100 boxes of matches in a row.
    5 complete rows.
    ? boxes of matches in all.
11. 100 packages of needles in a row.
    9 complete rows.
    ? packages of needles in all.

There once lived a prospector called Dirty Dan.
He was the straightest prospector there ever was. He always dug trenches in straight lines away from the riverbank. When he got ten metres from the river, he would turn right and dig a few more metres. Then he would stop.

Here are some of the patterns he made. Each day he made a new pattern and repeated it.



At night Dirty would add up the number of metres he had dug. Here is his addition.

DAY 1		DAY 2		DAY 3	
10	8	10	2	10	4
10	8	10	2	10	4
+10	+8	10	2	10	4
30	24	10	2	10	4
		10	2	10	4
		+10	+2	10	4
		60	12	+10	+4
				70	28
30		60		70	
+24		+12		+28	
54 m in all		72 m in all		98 m in all	

Dan could have saved some time.
He could have multiplied.

If Dan had known how to multiply, this is how his work would have looked.

DAY 1

$$\begin{array}{r} 10 \\ \times\ 3 \\ \hline 30 \end{array} \qquad \begin{array}{r} 8 \\ \times 3 \\ \hline 24 \end{array}$$

$$\begin{array}{r} 30 \\ +\ 24 \\ \hline \end{array}$$

54 m in all

DAY 2

$$\begin{array}{r} 10 \\ \times\ 6 \\ \hline 60 \end{array} \qquad \begin{array}{r} 2 \\ \times 6 \\ \hline 12 \end{array}$$

$$\begin{array}{r} 60 \\ +\ 12 \\ \hline \end{array}$$

72 m in all

DAY 3

$$\begin{array}{r} 10 \\ \times\ 7 \\ \hline 70 \end{array} \qquad \begin{array}{r} 4 \\ \times 7 \\ \hline 28 \end{array}$$

$$\begin{array}{r} 70 \\ +\ 28 \\ \hline \end{array}$$

98 m in all

Here is an even shorter method.

DAY 1
Each trench is 10 + 8, or 18 m long.
He dug 3.

$$\begin{array}{r} 10 + 8 \\ \times\ 3 \\ \hline 30 + 24 \end{array} \qquad \begin{array}{r} 18 \\ \times\ 3 \\ \hline 24 \\ 30 \\ \hline 54 \end{array} \quad \begin{array}{l} \\ 3 \times 8 \\ 3 \times 10 \\ \\ \text{in all} \end{array}$$

DAY 2
Each trench is 12 m long.
He dug 6.

$$\begin{array}{r} 12 \\ \times\ 6 \\ \hline 12 \\ 60 \\ \hline 72 \end{array} \quad \begin{array}{l} \\ 6 \times 2 \\ 6 \times 10 \\ \\ \end{array}$$

DAY 3
Each trench is 14 m long.
He dug 7.

$$\begin{array}{r} 14 \\ \times\ 7 \\ \hline 28 \\ 70 \\ \hline 98 \end{array} \quad \begin{array}{l} \\ 7 \times 4 \\ 7 \times 10 \\ \\ \end{array}$$

Your turn to multiply.

1. $\begin{array}{r} 12 \\ \times\ 8 \\ \hline \end{array}$ **2.** $\begin{array}{r} 13 \\ \times\ 7 \\ \hline \end{array}$ **3.** $\begin{array}{r} 17 \\ \times\ 6 \\ \hline \end{array}$ **4.** $\begin{array}{r} 15 \\ \times\ 4 \\ \hline \end{array}$ **5.** $\begin{array}{r} 19 \\ \times\ 9 \\ \hline \end{array}$ **6.** $\begin{array}{r} 16 \\ \times\ 5 \\ \hline \end{array}$ **7.** $\begin{array}{r} 18 \\ \times\ 8 \\ \hline \end{array}$

Once a month, Dirty Dan, the prospector, made the long trip into town for supplies.
Look at Dan's shopping list. Then look at the lists of prices.
Figure out how much Dan had to pay for each item on his list.

1. 5 packages cheese
2. 8 cans corned beef
3. 2 cans sardines
4. 2 packages tea
5. 5 packages coffee
6. 5 packages apricots
7. 4 cans peaches
8. 8 cans pears
9. 6 cans cherries
10. 7 cans pineapple
11. 8 cans peas
12. 8 cans beans

Find out how much his supplies cost in all.

CHEESE	12¢ a package
SAUSAGES	13¢ a dozen
CORNED BEEF	12¢ a can
SARDINES	13¢ a can
COFFEE	17¢ a package
TEA	14¢ a package
DRIED APRICOTS	15¢ a package
RAISINS	13¢ a package

CANNED FRUITS & VEGETABLES

PEACHES	16¢ a can
PEARS	19¢ a can
CHERRIES	19¢ a can
PINEAPPLE	11¢ a can
PEAS	17¢ a can
BEANS	14¢ a can
SWEET POTATOES	13¢ a can

1. Dirty Dan said, "A year's supply of soap will cost me about 50¢."
   What does that statement really say?
   - **a** Does it tell exactly how much was paid?
   - **b** Does it tell if it cost more than 50¢?
   - **c** Does it tell if it cost less than 50¢?
   - **d** Would he say that if he really paid 25¢? 75¢?
   - **e** Would he say that if he paid 40¢? 60¢?
   - **f** Would he say that if he paid 45¢? 55¢?
   - **g** Would he say that if he paid 48¢? 52¢?
   - **h** What was probably the lowest price he would have paid to make that statement? the highest price?

2. Socks cost 36¢ a pair.
   About how much do 2 pairs cost?
   $2 \times 36 = ?$ Round 36 up to 40. $2 \times 40 = ?$
   Will the 2 pairs cost less or more than 80¢?

3. Pick handles cost 18¢ each. Dan picks up six.
   About how much did he pay for the pick handles?
   $6 \times 18 = ?$ Round 18 up to 20. $6 \times 20 = ?$
   Did they cost more or less than $1.20?

4. Dan's mule plods at a speed of 8 km/h .
   About how far would they travel if Dan can push the mule for 21 h non-stop?
   8×21 is about 8×20.
   $8 \times 20 = 160$
   Is 8×21 more or less than 160?

Round the 2-digit number to the nearest ten. Then estimate the answer. Is the exact answer greater than or less than the estimate? Use > or < when you write the estimate on your paper.

Remember > means "is greater than" and < means "is less than."

1. 4×23 is about 4×20.
$4 \times 20 = 80$
$4 \times 23 \blacksquare 80$ (> or <)

2. 6×19 is about 6×20.
$6 \times 20 = \underline{?}$
$6 \times 19 \blacksquare 120$

3. 7×42 is about 7×40.
$7 \times 40 = \underline{?}$
$7 \times 42 \blacksquare 280$

4. 3×38 is about 3×40.
$3 \times \underline{?} = \underline{?}$
$3 \times 38 \blacksquare 120$

5. 8×27 is about $8 \times \underline{?}$.
$8 \times \underline{?} = \underline{?}$
$8 \times 27 \blacksquare 240$

6. 2×53 is about $2 \times \underline{?}$.
$2 \times \underline{?} = \underline{?}$
$2 \times 53 \blacksquare 100$

Estimates help you avoid silly mistakes. Estimate before you complete each problem. Write it down. Then multiply. Compare your answer with your estimate. Find out if your answer is reasonable.

	a	b	c	d	e	f	g
7.	37×5	42×7	57×6	32×8	28×6	67×4	63×7
8.	69×2	95×7	65×4	74×9	83×8	58×3	49×6

PROGRESS CHECK

Multiply.

1. 69×2	2. 58×5	3. 17×9	4. 74×8	5. 86×7	6. 45×6	7. 92×3

Let an estimate help you with multiplication of larger numbers.

1. The gym at Central School can hold 312 people. What is the greatest number of people who can go to 7 games? Estimate the answer.

Round 312 to the nearest hundred.

7×312 is about 7×300.
$7 \times 300 = 2100$

Is 312 less than or greater than 300?
Is 7×312 less than or greater than 2100?

2. The stadium can hold 1942 people. What is the greatest number of people who can go to 6 games? Estimate the answer.

Round 1942 to the nearest thousand.

6×1942 is about 6×2000.
$6 \times 2000 = 12\,000$

Is 1942 less than or greater than 2000?
Is 6×1942 less than or greater than 12 000?

When estimating, round —
2-digit numbers to the nearest ten,
3-digit numbers to the nearest hundred, and
4-digit numbers to the nearest thousand.

Round so that you can estimate. Is the exact answer greater than or less than the estimate? Use $>$ or $<$.

1. 4×572 is about 4×600.
$4 \times 600 = 2400$
$4 \times 572 \blacksquare 2400$ ($>$ or $<$)

2. 7×2134 is about 7×2000.
$7 \times 2000 = 14\,000$
$7 \times 2134 \blacksquare 14\,000$

3. 6×389 is about 6×400.
$6 \times 400 = 2400$
$6 \times 389 \blacksquare 2400$

4. 7×212 is about 7×200.
$7 \times 200 = \underline{?}$
$7 \times 212 \blacksquare 1400$

5. 3×4962 is about 3×5000.
$3 \times 5000 = \underline{?}$
$3 \times 4962 \blacksquare 15\,000$

6. 8×6035 is about 8×6000.
$8 \times 6000 = \underline{?}$
$8 \times 6035 \blacksquare 48\,000$

7. 5×94 is about 5×90.
$5 \times \underline{?} = \underline{?}$
$5 \times 94 \blacksquare \underline{?}$

8. 7×812 is about 7×800.
$7 \times \underline{?} = \underline{?}$
$7 \times 812 \blacksquare \underline{?}$

9. 9×634 is about $9 \times \underline{?}$.
$9 \times \underline{?} = \underline{?}$
$9 \times 634 \blacksquare \underline{?}$

10. 5×3341 is about $5 \times \underline{?}$.
$5 \times \underline{?} = \underline{?}$
$5 \times 3341 \blacksquare \underline{?}$

Bill had 30¢. He spent it all right here. He hit something with every ball.

1. How many points did Bill get? Complete the table.

2. How many prizes did he get?

Target	Number of hits	Total number of points
a duck	3	?
b star	5	?
c car	8	?
d square	4	?
e cat	6	?
f oval	7	?

A machine operator can punch out 315 pieces per hour. At this rate, how many pieces could 3 operators punch out in an hour?

$$\begin{array}{r} 315 \\ \times \quad 3 \\ \hline \end{array}$$

Jack figures it this way: The 3 operators first punch out 5 pieces each. Second, they punch out 10 pieces each. Third, they punch out 300 pieces each. Then you add to find out how many pieces they punch out in all.

first	second	third	
5	10	300	15
$\times 3$	$\times \ 3$	$\times \ 3$	30
15	30	900	$+900$
			945 in all

How many pieces could the 3 operators punch out in an 8-hour day?

$$\begin{array}{r} 945 \\ \times \quad 8 \\ \hline \end{array}$$

Betty figures it out like this: In each of the 8 hours the operators first punch out 5 pieces. Second, they punch out 40 pieces. Third, they punch out 900 pieces. She adds to find how many pieces they punch out during the whole day.

945	
$\times \ 8$	
40	first (8×5)
320	second (8×40)
7200	third (8×900)
7560	in all

A truck is carrying 473 crates. There are 5 boxes in each crate. How many boxes are there in the truck?

4 7 3

How many in 3 crates?

$$\begin{array}{r} 3 \\ \times 5 \\ \hline 15 \end{array}$$ Right?

4 7 3

How many in 70 crates?

$$\begin{array}{r} 70 \\ \times\ 5 \\ \hline 350 \end{array}$$ O.K.?

4 7 3

How many in 400 crates?

$$\begin{array}{r} 400 \\ \times\ 5 \\ \hline 2000 \end{array}$$ Agree?

Now how many boxes in all 473 crates?

$$\begin{array}{r} 473 \\ \times\ 5 \\ \hline 15 \\ 350 \\ 2000 \\ \hline 2365 \end{array}$$

5×3 ⟶ This is part of the product.

5×70 ⟶ This is part of the product.

5×400 ⟶ This is part of the product.

in all ⟶ This IS the product.

Copy and complete these.

1.
$$\begin{array}{r} 124 \\ \times\ 6 \\ \hline \blacksquare\blacksquare \\ \blacksquare\blacksquare\blacksquare \\ \blacksquare\blacksquare\blacksquare \\ \hline \blacksquare\blacksquare\blacksquare \end{array}$$
6×4
6×20
6×100
in all

2.
$$\begin{array}{r} 247 \\ \times\ 2 \\ \hline \blacksquare\blacksquare \\ \blacksquare\blacksquare \\ \blacksquare\blacksquare\blacksquare \\ \hline \blacksquare\blacksquare\blacksquare \end{array}$$
2×7
2×40
2×200
in all

3.
$$\begin{array}{r} 489 \\ \times\ 3 \\ \hline \blacksquare\blacksquare \\ \blacksquare\blacksquare\blacksquare \\ \blacksquare\blacksquare\blacksquare\blacksquare \\ \hline \blacksquare\blacksquare\blacksquare\blacksquare \end{array}$$
3×9
3×80
3×400
in all

4. $\begin{array}{r} 132 \\ \times\ 2 \end{array}$ **5.** $\begin{array}{r} 379 \\ \times\ 5 \end{array}$ **6.** $\begin{array}{r} 423 \\ \times\ 3 \end{array}$ **7.** $\begin{array}{r} 251 \\ \times\ 7 \end{array}$ **8.** $\begin{array}{r} 431 \\ \times\ 8 \end{array}$

Many radio stations have contests. WBBQ has one. Once every hour they give a new clue to the answer to their puzzle. Each clue gives a better idea of what the answer is. The first person to answer correctly wins a prize.

Let's use this contest to learn more about multiplication.

In the following puzzles, select the multiplication problem that is described by the clues.

PUZZLE 1

Clues: **1.** The first part of the product is 12.
2. The second part of the product is 40.

A	*B*	*C*	*D*
13 × 4	18 × 4	14 × 3	15 × 5

After which clue do you know the answer?

The first clue describes part of problems *A* and *C*.
The second clue is 40. So it's not *C*. The answer is *A*.
The answer is known after the second clue.

PUZZLE 2

Clues: **1.** The first part of the product is 24.
2. The second part of the product is 180.
3. The third part of the product is 1200.

A	*B*	*C*	*D*
452 × 5	234 × 6	268 × 3	782 × 2

After which clue do you know the answer?

PUZZLE 3

Clues: **1.** The first part of the product is 21.
2. The second part of the product is 140.
3. The third part of the product is 700.

A	*B*	*C*	*D*
467 × 3	123 × 7	19 × 9	74 × 4

After which clue do you know the answer?

PUZZLE 4

Clues: **1.** The first part of the product is 64.
2. The second part of the product is 640.
3. The third part of the product is 6400.

A	*B*	*C*	*D*
934 × 6	533 × 5	277 × 7	888 × 8

After which clue do you know the answer?

PUZZLE 5

Clues: **1.** The first part of the product is 8.
2. The second part of the product is 160.
3. The third part of the product is 2400.

A	*B*	*C*	*D*
421 × 8	142 × 4	284 × 2	642 × 4

After which clue do you know the answer?

Did you know the answer to the multiplication problem or the answer to the puzzle?

Compute to find the answers to each of the problems on this page.

$$\begin{array}{r} 504 \\ \times\ 8 \\ \hline 32 \\ 400 \\ \hline 432 \end{array}$$

$$\begin{array}{r} 504 \\ \times\ 8 \\ \hline 32 \\ 4000 \\ \hline 4032 \end{array}$$

$$\begin{array}{r} 504 \\ \times\ 8 \\ \hline 32 \\ 0 \\ 4000 \\ \hline 4032 \end{array}$$

How are these problems alike? How are they different?
Which problems are worked correctly?
Which are worked wrong?

It is helpful to use estimation to check the answer when a multiplication problem has zeros in it. Remember, you will want to round—

2-digit numbers to the nearest ten,
3-digit numbers to the nearest hundred, and
4-digit numbers to the nearest thousand.

Now look at the problems at the top of the page.
504 rounded to the nearest hundred is 500.

$$\begin{array}{r} 500 \\ \times\ 8 \\ \hline 4000 \end{array}$$

Does this give you a clue as to which answer is correct?

Estimate. Then multiply.

1. $\begin{array}{r} 150 \\ \times\ 9 \\ \hline \end{array}$ **2.** $\begin{array}{r} 605 \\ \times\ 4 \\ \hline \end{array}$ **3.** $\begin{array}{r} 3004 \\ \times\ 6 \\ \hline \end{array}$ **4.** $\begin{array}{r} 3079 \\ \times\ 8 \\ \hline \end{array}$ **5.** $\begin{array}{r} 9070 \\ \times\ 3 \\ \hline \end{array}$

One night Bruce was having trouble working this problem:

$$\begin{array}{r} 47 \\ \times\ 8 \\ \hline \end{array}$$

So he asked his dad for help. His dad said, "I'll write down the answer for you, but I don't have time to tell you how I got it. You'll have to figure that for yourself."

Here is what Bruce's dad wrote:

$$\begin{array}{r} {\scriptstyle 5}\ 47 \\ \times\ 8 \\ \hline 376 \end{array}$$

Bruce was really confused. He had never seen multiplication like this before. "What is dad doing now?" he thought.

Finally Bruce remembered how to do the problem.

$$\begin{array}{r} 47 \\ \times\ 8 \\ \hline 56 \\ 320 \\ \hline 376 \end{array}$$

Bruce got the same answer!

He wondered how his dad could work the problem doing all his work on only one line.

Can you help Bruce? Look at what his dad wrote.
Why are there 6 ones in the answer?
What happens to the 5 tens?
Why are there 37 tens in the answer?

$$\begin{array}{r} {\scriptstyle 5}\ 47 \\ \times\ 8 \\ \hline 376 \end{array}$$

1. Try to explain this computation:

$$\begin{array}{r} {\scriptstyle 1\ 2}\ 546 \\ \times\ 4 \\ \hline 2184 \end{array}$$

a Why do we write 4 ones in the answer?
b Why do we write 2 in the tens column above the 4?
c Why do we write 8 tens in the answer?
d Why do we write 1 in the hundreds column above the 5?
e Why do we write 1 hundred in the answer?
f Why do we write 2 thousands in the answer?

A store gets a shipment of 48 coats. They will sell for $30 apiece. What is the total value of the coats?

3 × 48 is 144. So 30 × 48 must be 1440.

$$\begin{array}{r} {\scriptstyle 2}\,48 \\ \times\ 3 \\ \hline 144 \end{array} \qquad \begin{array}{r} {\scriptstyle 2}\,48 \\ \times 30 \\ \hline 1440 \end{array}$$

Find the answers.

1.	52 × 30	**2.**	47 × 60	**3.**	61 × 50
4.	83 × 30	**5.**	28 × 70	**6.**	19 × 90
7.	55 × 40	**8.**	76 × 80	**9.**	94 × 40
10.	87 × 80	**11.**	63 × 50	**12.**	39 × 70

13. Big Pop bubble gum is stored in boxes. There are 40 packages in each box. How many packages are there in 37 boxes?

14. Happy Harry's Hazel Nuts come in 50 kg crates. The store orders 25 crates. How many kilograms of nuts were ordered?

15. There are 30 seats in each row. There are 30 rows. How many seats are there in all?

Suppose the 48 coats are to sell for $32 apiece. What is their total value now?

$$\begin{array}{r} 48 \\ \times\ 2 \\ \hline 96 \end{array} \qquad \begin{array}{r} 48 \\ \times 30 \\ \hline 1440 \end{array} \qquad \begin{array}{r} 48 \\ \times 32 \\ \hline 96 \\ 1440 \\ \hline 1536 \end{array} \quad \begin{array}{l} \\ \\ 2 \times 48 \\ 30 \times 48 \end{array}$$

Multiply.

1. $\begin{array}{r} 54 \\ \times 23 \\ \hline \end{array}$	**2.** $\begin{array}{r} 18 \\ \times 61 \\ \hline \end{array}$	**3.** $\begin{array}{r} 57 \\ \times 17 \\ \hline \end{array}$	**4.** $\begin{array}{r} 46 \\ \times 92 \\ \hline \end{array}$	**5.** $\begin{array}{r} 73 \\ \times 55 \\ \hline \end{array}$
6. $\begin{array}{r} 35 \\ \times 87 \\ \hline \end{array}$	**7.** $\begin{array}{r} 69 \\ \times 26 \\ \hline \end{array}$	**8.** $\begin{array}{r} 76 \\ \times 95 \\ \hline \end{array}$	**9.** $\begin{array}{r} 80 \\ \times 89 \\ \hline \end{array}$	**10.** $\begin{array}{r} 19 \\ \times 77 \\ \hline \end{array}$

Just for fun. Be a detective. Somebody did these problems the long way. Find the missing parts of each of the problems. Match the number of the problem with the letter that shows parts of the product and the answer.

11. $\begin{array}{r} 15 \\ \times 12 \\ \hline \end{array}$	**12.** $\begin{array}{r} 21 \\ \times 32 \\ \hline \end{array}$	**13.** $\begin{array}{r} 41 \\ \times 21 \\ \hline \end{array}$	**14.** $\begin{array}{r} 78 \\ \times 56 \\ \hline \end{array}$	**15.** $\begin{array}{r} 83 \\ \times 74 \\ \hline \end{array}$

A	**B**	**C**	**D**	**E**
1	12	48	2	10
40	320	420	40	20
20	210	400	30	50
800	5600	3500	600	100
861	6142	4368	672	180

PROGRESS CHECK

This is a checkup on what you have learned. Use any type of multiplication you can.

1. 9×7	2. 8×6	3. 5×3	4. 7×4
5. 22×3	6. 34×2	7. 58×6	8. 279×9
9. 575×7	10. 42×13	11. 35×78	12. 83×93

They decided to have a carnival to raise money for their project.

13. 83 adults bought tickets.
An adult's ticket cost 75¢.
How much money here?

14. 67 children bought tickets.
A child's ticket cost 35¢.
How much money here?

15. 92 fishpond tickets were sold.
Each ticket cost 15¢.
How much money here?

16. 85 fun-house tickets were sold.
Each ticket cost 10¢.
How much money here?

17. 62 ringtoss tickets were sold.
Each ticket cost 20¢.
How much money here?

18. 99 cakewalk tickets were sold.
Each ticket cost 25¢.
How much money here?

*How much money did they collect in all?

An automobile dealer figures he makes about $379 in profit on each car he sells. He has sold 26 cars so far this year. How much profit did he make on the first 6 cars? on the next 20? on all 26?

379	379	379	
× 6	× 20	× 26	
2274	7580	2274	6×379
		7580	20×379
		9854	

In the third problem, why did we multiply 379 by 6?
Why did we multiply 379 by 20?
How did we get 9854?

Multiply

1.	247 × 25	**2.**	384 × 48	**3.**	717 × 85
4.	684 × 63	**5.**	909 × 98	**6.**	474 × 32
7.	575 × 68	**8.**	875 × 59	**9.**	625 × 48

10. There are 24 hours in a day. There are 365 days in a year. How many hours are there in one year?

11. You attend school about 185 days each year. If you go to school for 13 years, about how many days of school will you attend?

12. There are 60 minutes in one hour. How many minutes in one day?

***13.** Jan's mother works in a store 5 hours a day, 6 days a week. Jan's dad works in a factory 8 hours a day, 5 days a week.

a Who works more hours each week?

b How many more hours each week?

c Both work 50 weeks each year. How many hours does each work in one year?

Sometimes prices of things increase. It doesn't seem like much to pay a penny or two more for something. But extra pennies can count up!

Your family buys certain food every week. Find out how much more you will pay for an item over a period of time. Compute the amount you would pay with the old price and with the new price. Figure out the amount paid in one month (4 weeks), in 6 months (26 weeks), and in 1 year's time (52 weeks).

YOU BUY	NUMBER IN 1 WEEK	OLD PRICE FOR 1	NEW PRICE FOR 1	TOTAL AMOUNT PAID IN					
				4 WEEKS		26 WEEKS		52 WEEKS	
				old	new	old	new	old	new
1. BREAD	3 LOAVES	25¢	26¢	a	b	c	d	e	f
2. MILK	4 SMALL CARTONS	59¢	61¢	a	b	c	d	e	f
3. ICE CREAM	1 LARGE CARTON	85¢	87¢	a	b	c	d	e	f
4. COFFEE	1 CAN	93¢	97¢	a	b	c	d	e	f
5. HOT DOGS	1 PACKAGE	82¢	84¢	a	b	c	d	e	f
***6.** EGGS	1 DOZEN	49¢	50¢	a	b	c	d	e	f

Talk about these questions.

Are prices for any one thing the same all over the country? Have you heard about other price changes? How do these price changes affect your family?

CHECKOUT

	a	b	c	d	e
1.	14 × 4	42 × 6	27 × 8	58 × 9	91 × 7
2.	39 × 2	85 × 8	76 × 3	74 × 7	89 × 5
3.	342 × 6	765 × 8	809 × 9	762 × 5	801 × 4
4.	539 × 7	642 × 6	810 × 2	375 × 8	692 × 3
5.	26 × 53	54 × 45	13 × 78	82 × 34	69 × 67
6.	77 × 19	48 × 87	31 × 46	37 × 62	37 × 38

6 FRACTIONS

Ziggy and Zap started a club. They called themselves "The Zany Zees." There were only two people in the club: Ziggy and Zap.

They decided to have a party for all club members. They got a cake. They made popcorn balls. They bought a big jug of apple cider.

1. Ziggy was a thinker. He drew two pictures to show how they could cut the cake. He shaded the part he wanted in each picture. Write the fractions that tell how much cake he wanted in A and how much he wanted in B.

2. Zap said no to Ziggy's plans. He wanted $\frac{1}{4}$ of the cake. Draw a picture to show how much Zap wanted for himself.

3. The friends decided to cut the cake in 8 pieces of the same size.

   a What fraction would represent 1 piece?

   b They kept a record of how much was gone as each took a piece. In what order do you think they wrote these fractions?
   $\frac{5}{8}$ $\frac{3}{8}$ $\frac{1}{8}$ $\frac{2}{8}$ $\frac{4}{8}$

4. Ziggy ate $\frac{5}{9}$ of the popcorn balls.
   Then Zap ate $\frac{2}{9}$ of them.
   How much of the popcorn did they eat?

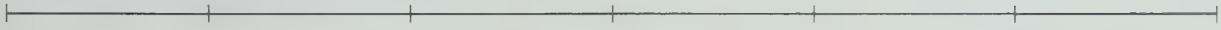
   a Who ate more? **b** How much more?

They didn't drink much cider. Neither one of them felt very good.

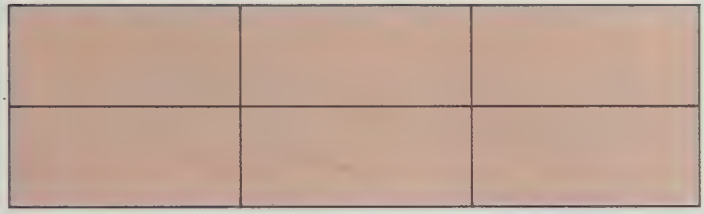
But you will feel good if you learn about fractions. Try it, anyway. Make it your goal.

Mr. Smith owns an apartment house. He knows that people sometimes have a hard time sharing things equally. He doesn't like arguments. He works hard to avoid them. Here are some of the things he did to help people get along.

Six families live in the building.
The clothesline is marked into six parts of equal size.

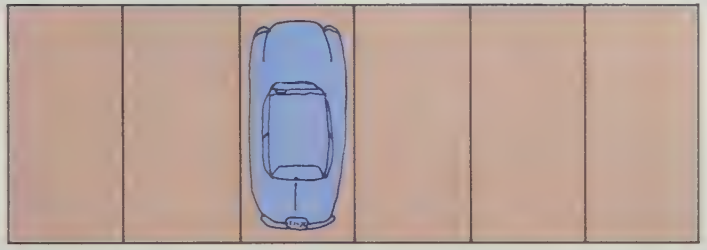


1. The storage space in the basement is divided into six equal spaces.



Could the space be divided into six equal parts in another way?

2. The parking lot is divided into six equal spaces.

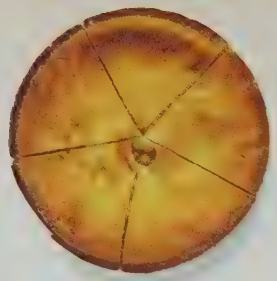


Could the space be divided into six equal parts in another way?

3. There is only one washing machine. How could Mr. Smith divide this into six equal parts?

4. One family has two boys. They always argue. Mr. Smith can't help that. One day he heard one boy say to his brother, "You got the biggest half of the candy bar." Is it possible to get a half that is bigger than another half?

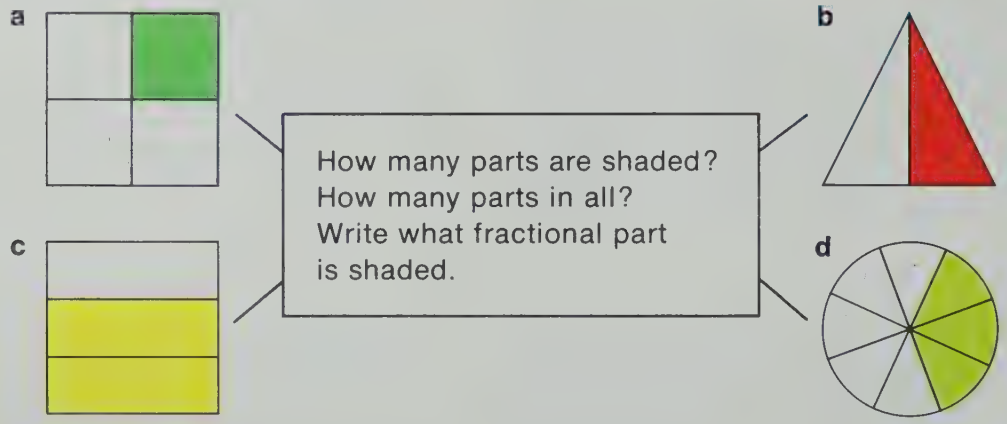
Sue baked an apple pie for dessert. She cut it into 5 equal pieces. Sue really likes apple pie.



She ate 2 pieces. What fractional part of the pie did she eat?

$\frac{2}{5}$ ← This number is called the *numerator*. The number of pieces Sue ate.
$\frac{2}{5}$ ← This number is the *denominator*. The number of pieces in the whole pie.

1. Answer the questions for each region.



2. Draw and shade regions to show each fraction.

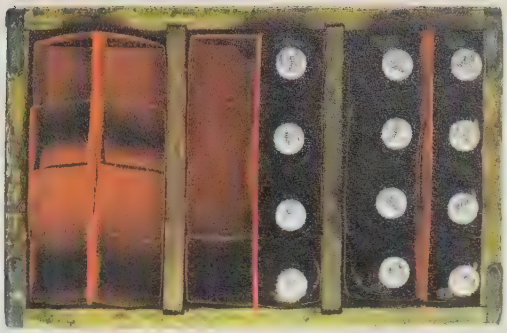
a $\frac{1}{2}$ **b** $\frac{3}{4}$ **c** $\frac{1}{8}$ **d** $\frac{2}{3}$

3. **a** Does this show $\frac{3}{4}$?

b Does this show $\frac{3}{4}$?

4. Sue's kid brother ate none of the 5 pieces. He ate $\frac{0}{5}$ of the pie. Does this make sense?

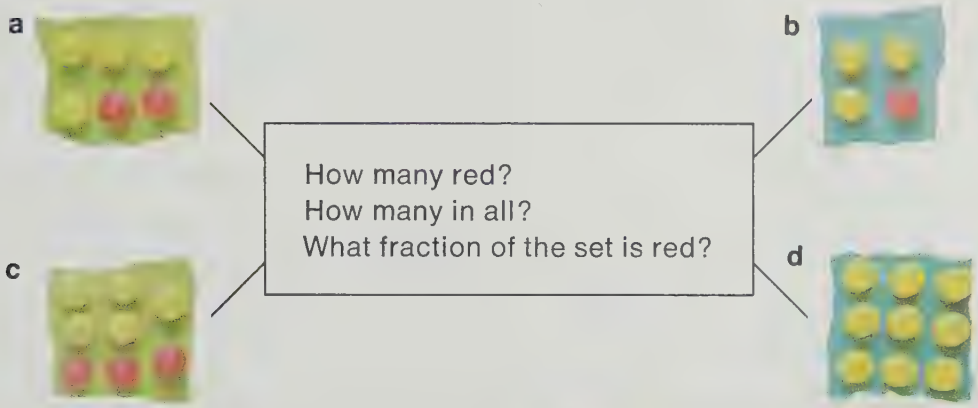
1. A case has 24 slots for bottles.
Bottles are in 12 of the slots.
What fraction of the slots has bottles?



If the case were full, it would represent 1 whole case—the total. The fraction $\frac{12}{24}$ tells what part of the case is filled.

12 ← The numerator tells how many slots are filled.
24 ← The denominator tells the total number of slots.

2. Answer the questions for each set of candles.

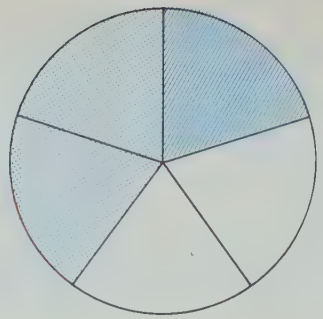


3. A box can hold 12 doughnuts. Some of the doughnuts have been eaten. 4 doughnuts are left in the box. What fractional part remains?

4. Draw doughnuts in boxes to show each fraction.

a $\frac{1}{12}$ **b** $\frac{1}{2}$ **c** $\frac{1}{4}$ **d** $\frac{1}{3}$

PRACTICE



1. **a** How many same-size parts?

b Each part is what fraction of the whole region?

c What fractional part has stripes?

d What fractional part is dotted?

e Which is more, $\frac{2}{5}$ or $\frac{1}{5}$ of the region?

2. Draw a region that shows fourths. Shade $\frac{1}{4}$.

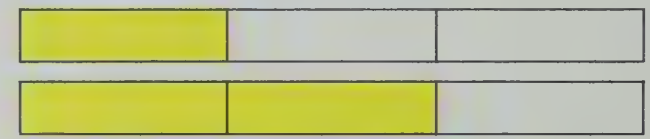
a What fraction of the region is not shaded?

b Which is less, $\frac{1}{4}$ or $\frac{3}{4}$ of the region?

3. **a** What fraction of region A is shaded?

b What fraction of region B is shaded?

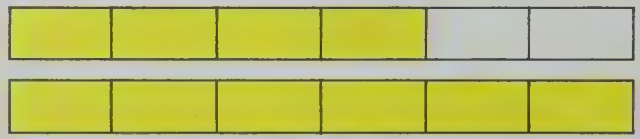
c Which is more, $\frac{1}{3}$ or $\frac{2}{3}$ of a region?



4. **a** What fraction of region C is shaded?

b What fraction of region D is shaded?

c Which is less, $\frac{4}{6}$ or $\frac{6}{6}$ of a region?



5. Which fraction of a region is more?

a $\frac{5}{8}$ or $\frac{3}{8}$

b $\frac{0}{8}$ or $\frac{6}{8}$

c $\frac{8}{8}$ or $\frac{2}{8}$

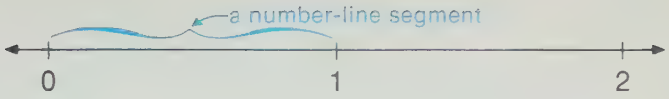
6. Which fraction of a region is less?

a $\frac{6}{10}$ or $\frac{4}{10}$

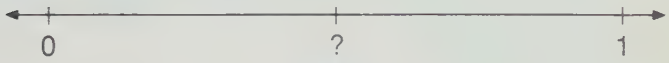
b $\frac{1}{10}$ or $\frac{0}{10}$

c $\frac{9}{10}$ or $\frac{10}{10}$

A piece of the number line is called a number-line segment.

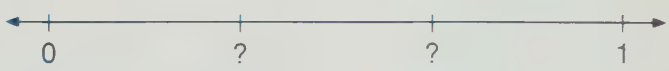


1. Use the number-line segment from 0 to 1. The segment on the right is divided into 2 equal parts.



   a What fraction of the segment is each part?
   b What fraction can name this point?

2. Now the segment is divided into 3 equal parts.

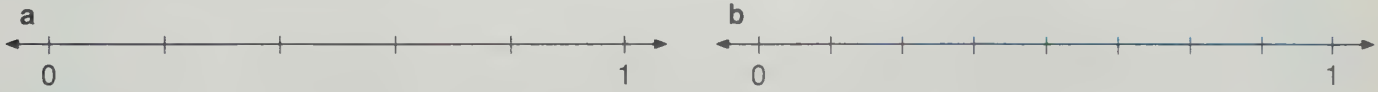


   a What fraction is each part?
   b What fraction can name this point?
   c What fraction can name this point?

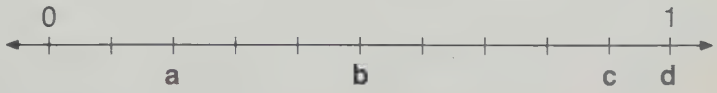
3. Now the segment is divided into 4 equal parts.

   a What fraction is each part?
   b What fraction names this point?
   c What fraction names this point?
   d What fraction names this point?

4. Copy each of these number lines and name each point.

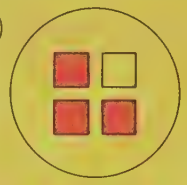


5. The length of the unit from 0 to 1 will be longer on the next number-line segment. This length is divided into 10 equal parts. Write the fraction that names each of the points marked with a letter.

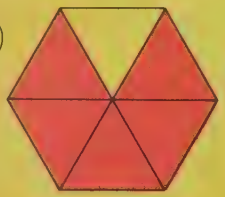


PROGRESS CHECK

Write the fraction that tells the number of shaded parts.

1. 

2.

3. 

4.

Write the fraction that belongs at the point of the arrow.

5.

6.

Fill in the missing numerators. Follow the pattern.

7. $\frac{0}{8}, \frac{1}{8}, \frac{2}{8}, \frac{?}{8}, \frac{4}{8}, \frac{?}{8}, \frac{6}{8}, \frac{?}{8}$

8. $\frac{?}{10}, \frac{5}{10}, \frac{6}{10}, \frac{?}{10}, \frac{8}{10}, \frac{?}{10}, \frac{?}{10}$

Order these sets from smallest to largest.

9. $\frac{3}{5}, \frac{1}{5}, \frac{4}{5}, \frac{2}{5}$

10. $\frac{0}{8}, \frac{8}{8}, \frac{6}{8}, \frac{3}{8}$

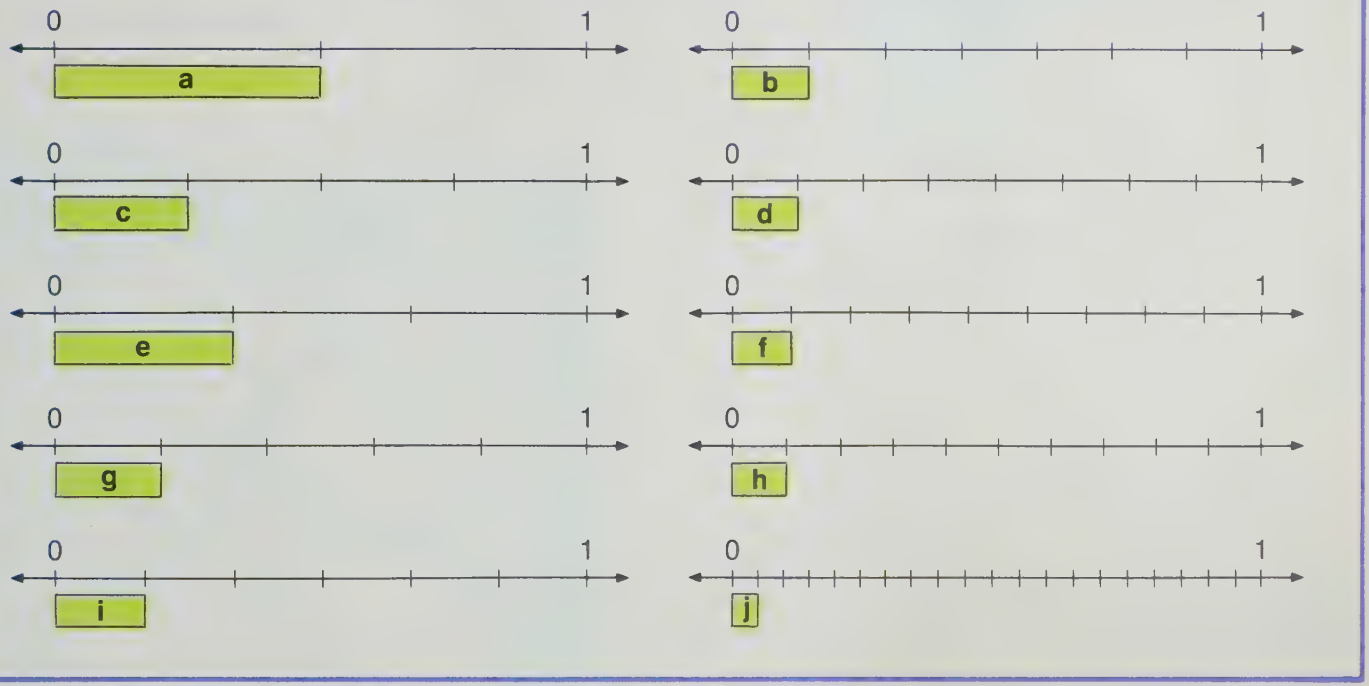
11. Which fractions at the right are greater than $\frac{3}{4}$?

12. Which fractions at the right are less than $\frac{3}{4}$?

$\frac{0}{4}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}$

13. Which fractions are between $\frac{2}{10}$ and $\frac{8}{10}$? $\frac{5}{10}, \frac{3}{10}, \frac{9}{10}, \frac{6}{10}, \frac{1}{10}, \frac{7}{10}, \frac{10}{10}, \frac{4}{10}, \frac{2}{10}, \frac{0}{10}$

1. One unit can be equally divided in many ways.
Look at the strip below each number-line segment.
Write how many strips it would take to have one whole unit.



2. Which is more?

a $\frac{1}{2}$ unit or $\frac{2}{2}$ unit **b** $\frac{4}{7}$ unit or $\frac{3}{7}$ unit **c** $\frac{1}{4}$ unit or $\frac{3}{4}$ unit

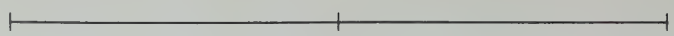
3. Can 1 be renamed as a fraction?
Use the number lines above for help.
Name at least 6 fraction names for 1.

4. Can 0 be renamed as a fraction? Think!
How many $\frac{1}{2}$s from 0 to 0?

1. Pretend this is a licorice stick.

a How many parts?

b How much is one part?

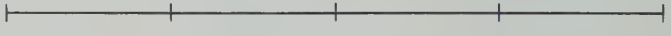


2. **a** Now how many parts?

b How much is one part?

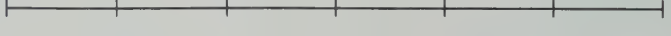
3. **a** Now how many parts?

b How much is one part?



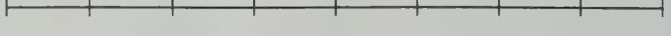
4. **a** Now how many parts?

b How much is one part?



5. **a** Now how many parts?

b How much is one part?



6. Pretend you really like licorice.
There is 1 stick and no more.
Name the amount you'd rather have.

a $\frac{1}{2}$ or $\frac{1}{3}$	**b** $\frac{1}{3}$ or $\frac{1}{4}$	**c** $\frac{1}{4}$ or $\frac{1}{6}$	**d** $\frac{1}{6}$ or $\frac{1}{8}$
e $\frac{1}{3}$ or $\frac{2}{3}$	**f** $\frac{1}{4}$ or $\frac{2}{4}$	**g** $\frac{1}{6}$ or $\frac{2}{6}$	**h** $\frac{1}{8}$ or $\frac{2}{8}$
i $\frac{2}{2}$ or $\frac{2}{3}$	**j** $\frac{2}{3}$ or $\frac{2}{4}$	**k** $\frac{2}{4}$ or $\frac{2}{6}$	**l** $\frac{2}{6}$ or $\frac{2}{8}$

LOOK OUT! Use the pictures above to help.

m $\frac{2}{3}$ or $\frac{3}{4}$	**n** $\frac{1}{2}$ or $\frac{2}{6}$	**o** $\frac{2}{4}$ or $\frac{3}{8}$	**p** $\frac{5}{6}$ or $\frac{6}{8}$

1. Dave broke a big candy bar into 4 equal pieces. On Tuesday he ate 1 piece. On Wednesday he ate 2 pieces.

a What fraction of the candy bar did he eat on Tuesday?

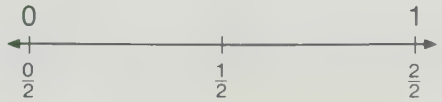
b What fraction did he eat on Wednesday?

c What fraction did he eat over the two days?

d The math sentence $\frac{1}{4} + \frac{2}{4} = \underline{?}$ fits this story.

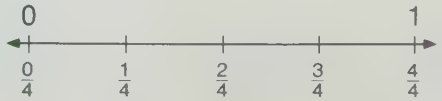
Number lines can help picture the next problems. You find the answers.

2. He used $\frac{1}{2}$ the string for one box. He used another $\frac{1}{2}$ for the other box. How much string did he use in all?



$\frac{1}{2} + \frac{1}{2} = \underline{?}$

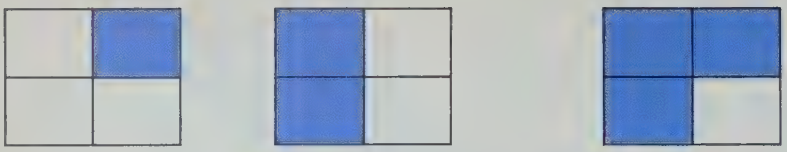
3. She used $\frac{1}{4}$ of the ribbon for her sister. She used $\frac{2}{4}$ of the ribbon for herself. How much ribbon was used?



$\frac{1}{4} + \frac{2}{4} = \underline{?}$

4. They ran $\frac{1}{3}$ of the distance. They walked $\frac{1}{3}$ of the distance. And then they rested. How far had they gone before they rested?

$\frac{1}{3} + \frac{1}{3} = \underline{?}$



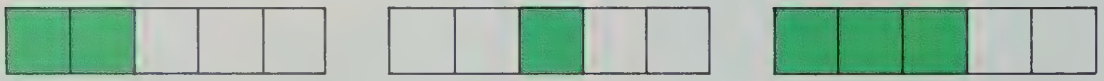
$\frac{1}{4}$ + $\frac{2}{4}$ = $\frac{3}{4}$

1. In the diagram above, look at the denominator of each fraction. What does it tell you? Look at the numerator in the sum. Why is it 3?

2. Write the addition sentence for each of these diagrams.

a

b



c

3. Find the sums.

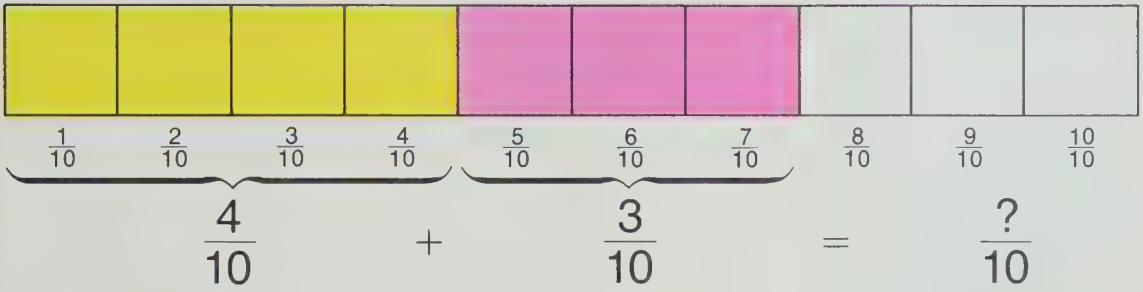
a $\frac{3}{10} + \frac{4}{10} = \underline{?}$ **b** $\frac{1}{8} + \frac{5}{8} = \underline{?}$ **c** $\frac{2}{5} + \frac{2}{5} = \underline{?}$ **d** $\frac{5}{8} + \frac{2}{8} = \underline{?}$

e $\frac{2}{7} + \frac{3}{7} = \underline{?}$ **f** $\frac{3}{8} + \frac{4}{8} = \underline{?}$ **g** $\frac{6}{11} + \frac{3}{11} = \underline{?}$ **h** $\frac{1}{5} + \frac{3}{5} = \underline{?}$

You have been doing a good job

Has anyone found a very fast way to add fractions?

This region has been separated into 10 parts.



Time out to review

What do the parts of a fraction stand for?

$\frac{4}{10}$ ← The numerator tells the number of parts we are looking at.

$\frac{4}{10}$ ← The denominator tells the number of parts in all.

Go back to the addition problem above.

$\frac{4}{10} + \frac{3}{10}$ ← We are adding 4 parts and 3 parts.

$\frac{4}{10} + \frac{3}{10}$ ← There are 10 parts in all.

Could we think about addition like this: $\frac{4}{10} + \frac{3}{10} = \frac{4+3}{10} = \frac{7}{10}$?

If the denominators of both fractions show the same number of equal parts, then add the numerators.

1. $\frac{2}{3} + \frac{1}{3} = \frac{2+1}{3} = \frac{?}{3}$

2. $\frac{1}{4} + \frac{2}{4} = \frac{1+2}{4} = \frac{?}{4}$

3. $\frac{6}{12} + \frac{2}{12} = \frac{6+2}{12} = \frac{?}{12}$

4. $\frac{5}{10} + \frac{2}{10} = \frac{5+2}{10} = \frac{?}{10}$

5. $\frac{1}{5} + \frac{3}{5} = \frac{?+?}{5} = \frac{?}{5}$

6. $\frac{3}{7} + \frac{2}{7} = \frac{?+?}{7} = \frac{?}{7}$

7. $\frac{5}{9} + \frac{2}{9} = \frac{?+?}{9} = \frac{?}{9}$

8. $\frac{1}{8} + \frac{7}{8} = \frac{?+?}{8} = \frac{?}{8}$

Practise addition.

1. $\frac{2}{7} + \frac{4}{7} = \frac{2+4}{7} = \underline{?}$

2. $\frac{4}{9} + \frac{4}{9} = \frac{4+4}{9} = \underline{?}$

3. $\frac{1}{6} + \frac{4}{6} = \frac{1+4}{6} = \underline{?}$

4. $\frac{3}{8} + \frac{2}{8} = \frac{3+2}{8} = \underline{?}$

5. $\frac{1}{4} + \frac{3}{4} = \underline{?}$

6. $\frac{2}{10} + \frac{7}{10} = \underline{?}$

7. $\frac{1}{8} + \frac{0}{8} = \underline{?}$

8. $\frac{0}{4} + \frac{0}{4} = \underline{?}$

If you were really hungry, would you rather have—

$\frac{2}{2}$ of a hamburger or $\frac{3}{3}$ of a hamburger?

$\frac{5}{5}$ of a bag of candy or $\frac{6}{6}$ of a bag of candy?

$\frac{4}{4}$ of a pie or $\frac{0}{0}$ of a pie?

If you have 0 pies cut into 0 parts, could I have one of these parts?

THINK $\frac{0}{0}$ NO!

THAT'S NONSENSE!

If you have a pie cut into 4 parts, would you give me 0 parts? Sure you would.

$\frac{0}{4}$ is O.K.

1. Add.

a $\frac{1}{5} + \frac{1}{5}$ **b** $\frac{2}{4} + \frac{1}{4}$ **c** $\frac{3}{8} + \frac{3}{8}$ **d** $\frac{5}{10} + \frac{4}{10}$ **e** $\frac{3}{6} + \frac{3}{6}$ **f** $\frac{1}{3} + \frac{2}{3}$

Get ready to shift gears. You will still be thinking about fractions. But watch out! Draw pictures to help you find answers.

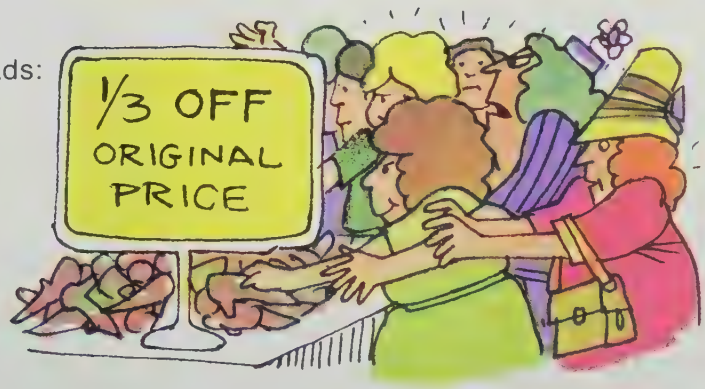
2. There were 5 out of 6 pieces of pie left in the pan. That's $\frac{5}{6}$ of the pie. Three more pieces were eaten. That's $\frac{3}{6}$ of the pie. How much of the pie was left in the pan?

3. Alan has $\frac{3}{4}$ of the orange.
Mary has $\frac{1}{4}$ of the orange.
How much more has Alan?

4. The race announcer said, "The horses are entering the first-quarter turn." If the horses had run $\frac{1}{4}$ of the race, how much of the race was left to run?

5. Dave had a half dollar.
He spent a quarter dollar.
How much of a dollar did he have left?

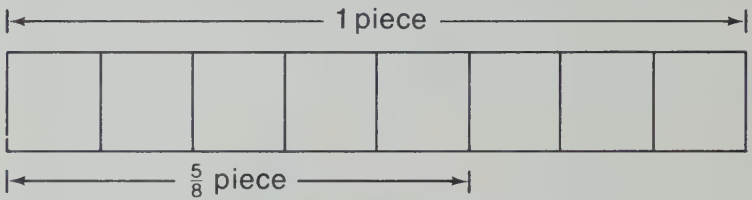
6. There is a sale. The sign reads: If you bought something at this sale, how much of the original price would you pay?



7. There was $\frac{3}{4}$ of a cake on the table.
After dinner there was $\frac{1}{4}$ of the cake.
How much was eaten at dinner?

The operation of subtraction with fractions really isn't hard. This is the kind of problem that got you started thinking subtraction.

Janice entered Max in the dog show. Max isn't very handsome. Janice put a bow around his neck. She put another bow on his tail. She had a piece of polka dot ribbon. She used $\frac{5}{8}$ of it for the bow around his neck. How much ribbon did she have left for the tail?



You can show subtraction with other models too.

There were $\frac{5}{5}$, but $\frac{1}{5}$ is gone. Now there are $\frac{4}{5}$.
Take away $\frac{1}{5}$ from $\frac{4}{5}$. How much remains?

$$\frac{4}{5} - \frac{1}{5} = \underline{?}$$

Your turn. Subtract. Draw models if you need to.

1. $\frac{3}{3} - \frac{2}{3}$ **2.** $\frac{3}{5} - \frac{1}{5}$ **3.** $\frac{2}{2} - \frac{1}{2}$ **4.** $\frac{3}{6} - \frac{2}{6}$

5. $\frac{4}{5} - \frac{2}{5}$ **6.** $\frac{6}{8} - \frac{3}{8}$ **7.** $\frac{1}{4} - \frac{1}{4}$ **8.** $\frac{3}{4} - \frac{1}{4}$

There were $\frac{6}{6}$, but $\frac{1}{6}$ is gone.
Now there are $\frac{5}{6}$.
Take $\frac{3}{6}$ away from $\frac{5}{6}$.
How much remains? $\frac{5}{6} - \frac{3}{6} = \frac{?}{6}$

Look at that problem again.
Do the denominators of both fractions show the same number of equal parts?

Can you think about subtraction like this: $\frac{5}{6} - \frac{3}{6} = \frac{5-3}{6} = \frac{2}{6}$?
Sure you can. Go to it. Show how good you are with subtraction.

1. $\frac{2}{3} - \frac{1}{3} = \frac{2-1}{3} = \frac{?}{3}$ **2.** $\frac{7}{10} - \frac{3}{10} = \frac{7-3}{10} = \frac{?}{10}$ **3.** $\frac{1}{2} - \frac{0}{2} = \frac{1-0}{2} = \frac{?}{2}$ **4.** $\frac{5}{8} - \frac{5}{8} = \frac{5-5}{8} = \frac{?}{8}$

Even the hard ones aren't hard this way.

5. $\frac{10}{10} - \frac{1}{10} = \frac{10-1}{10} = \underline{?}$ **6.** $\frac{7}{7} - \frac{2}{7} = \frac{7-2}{7} = \underline{?}$ **7.** $\frac{8}{9} - \frac{4}{9} = \underline{?}$ **8.** $\frac{5}{6} - \frac{4}{6} = \underline{?}$

You are doing a good job.
Try your skill with some word problems.

9. I had $\frac{3}{4}$ of the candy. I gave you $\frac{1}{4}$. How much do I have left?

10. He had $\frac{1}{2}$ of the job done. His brother did $\frac{1}{2}$ of the job. How much of the job was left to do?

11. You had 1 whole candy bar. You gave me $\frac{1}{2}$ of it. How much do you have left?

If the denominators show the same number of equal-size parts, then focus on the numerator whether you add or subtract.

$$\frac{5}{12} + \frac{2}{12} = \frac{5+2}{12} = \frac{7}{12}$$

$$\frac{7}{12} - \frac{2}{12} = \frac{7-2}{12} = \frac{5}{12}$$

Practise addition on this side.

1. $\frac{1}{6} + \frac{3}{6} = \frac{1+3}{6} = \frac{?}{6}$
3. $\frac{2}{9} + \frac{7}{9} = \frac{2+7}{9} = \frac{?}{9}$
5. $\frac{7}{10} + \frac{2}{10} = \frac{?+?}{10} = \frac{?}{10}$
7. $\frac{3}{5} + \frac{1}{5} = \frac{?+?}{5} = \frac{?}{5}$
9. $\frac{4}{7} + \frac{2}{7} = \frac{?+?}{7} = \underline{?}$
11. $\frac{1}{8} + \frac{6}{8} = \underline{?}$
13. $\frac{3}{10} + \frac{4}{10} = \underline{?}$
15. $\frac{4}{6} + \frac{1}{6} = \underline{?}$

Practise subtraction on this side.

2. $\frac{6}{7} - \frac{2}{7} = \frac{6-2}{7} = \frac{?}{7}$
4. $\frac{7}{10} - \frac{4}{10} = \frac{7-4}{10} = \frac{?}{10}$
6. $\frac{6}{8} - \frac{1}{8} = \frac{?-?}{8} = \frac{?}{8}$
8. $\frac{7}{8} - \frac{6}{8} = \frac{?-?}{8} = \frac{?}{8}$
10. $\frac{5}{6} - \frac{1}{6} = \frac{?-?}{6} = \underline{?}$
12. $\frac{9}{10} - \frac{2}{10} = \underline{?}$
14. $\frac{4}{6} - \frac{3}{6} = \underline{?}$
16. $\frac{4}{5} - \frac{1}{5} = \underline{?}$

PRACTICE

Compute. Be careful! There is practice in addition and subtraction.

1. $\frac{1}{4}+\frac{2}{4}$	**2.** $\frac{5}{6}-\frac{2}{6}$	**3.** $\frac{5}{6}-\frac{1}{6}$
4. $\frac{1}{5}+\frac{1}{5}$	**5.** $\frac{4}{6}+\frac{2}{6}$	**6.** $\frac{2}{8}+\frac{2}{8}$
7. $\frac{11}{12}-\frac{9}{12}$	**8.** $\frac{4}{9}+\frac{4}{9}$	**9.** $\frac{0}{5}+\frac{3}{5}$
10. $\frac{3}{8}-\frac{3}{8}$	**11.** $\frac{4}{5}-\frac{3}{5}$	**12.** $\frac{3}{4}+\frac{0}{4}$
13. $\frac{5}{8}-\frac{4}{8}$	**14.** $\frac{2}{10}+\frac{4}{10}$	**15.** $\frac{1}{12}+\frac{1}{12}$
16. $\frac{7}{9}-\frac{5}{9}$	***17.** $\frac{58}{100}-\frac{31}{100}$	**18.** $*\frac{295}{314}-\frac{231}{314}$

19. Bill had sold only $\frac{1}{4}$ of his book of tickets. How much of the book did he have left to sell?

20. Tim sold $\frac{3}{4}$ of his book of tickets. How much more of a book had Tim sold than Bill? How much of a book did Tim have left to sell?

PROGRESS CHECK

Add.

(1.) $\frac{3}{5}+\frac{1}{5}$ (2.) $\frac{1}{4}+\frac{3}{4}$ (3.) $\frac{3}{9}+\frac{6}{9}$

Subtract.

(4.) $\frac{3}{4}-\frac{1}{4}$ (5.) $\frac{4}{5}-\frac{3}{5}$ (6.) $\frac{8}{8}-\frac{6}{8}$

If you missed one addition problem, do set 1 below.
If you missed one subtraction problem, do set 2.

SET 1

1. $\frac{1}{3}+\frac{1}{3}$ 2. $\frac{2}{5}+\frac{2}{5}$ 3. $\frac{5}{9}+\frac{2}{9}$ 4. $\frac{4}{10}+\frac{5}{10}$ 5. $\frac{3}{6}+\frac{2}{6}$

6. $\frac{1}{2}+\frac{1}{2}$ 7. $\frac{1}{6}+\frac{5}{6}$ 8. $\frac{3}{9}+\frac{5}{9}$ 9. $\frac{2}{5}+\frac{3}{5}$ 10. $\frac{5}{8}+\frac{2}{8}$

SET 2

1. $\frac{3}{5}-\frac{2}{5}$ 2. $\frac{6}{8}-\frac{4}{8}$ 3. $\frac{5}{6}-\frac{2}{6}$ 4. $\frac{4}{4}-\frac{2}{4}$ 5. $\frac{4}{6}-\frac{1}{6}$

6. $\frac{3}{6}-\frac{2}{6}$ 7. $\frac{7}{10}-\frac{5}{10}$ 8. $\frac{7}{8}-\frac{1}{8}$ 9. $\frac{6}{7}-\frac{5}{7}$ 10. $\frac{9}{9}-\frac{7}{9}$

1. The pie was cut in 5 pieces.
   - **a** Mom didn't eat any of the pieces. What fraction can show the amount she ate?
   - **b** Big Ben ate 5 of the 5 pieces. He ate it all! What fraction can show the amount he ate?

2. There are 9 marbles. You have 4. I have 3.
   - **a** What part of the 9 marbles do you have?
   - **b** What part of the 9 marbles do I have?
   - **c** What part of the 9 marbles do we have together?

3. There were 10 sticks of gum. Ron chewed 2. Don chewed 5.
   - **a** What part of the 10 sticks did Ron chew?
   - **b** What part of the 10 sticks did Don chew?
   - **c** What part of the 10 sticks did Ron and Don chew?

4. There were 12 pieces of candy. Ellen ate 1. Helen ate 8. What part of the 12 pieces did Ellen and Helen eat?

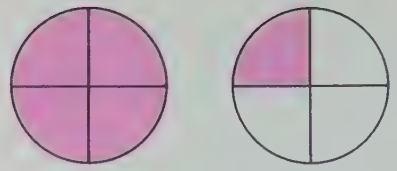
5. There are 7 pencils. 2 of them are red. 2 of them are blue. What part of the 7 pencils is red or blue?

1. How many fourths are shaded?
How many wholes are shaded?

a How many more fourths than one whole are shaded?

b Is the sentence $\frac{5}{4} = 1\frac{1}{4}$ true?

c Do $\frac{5}{4}$ and $1\frac{1}{4}$ name the same shaded area?



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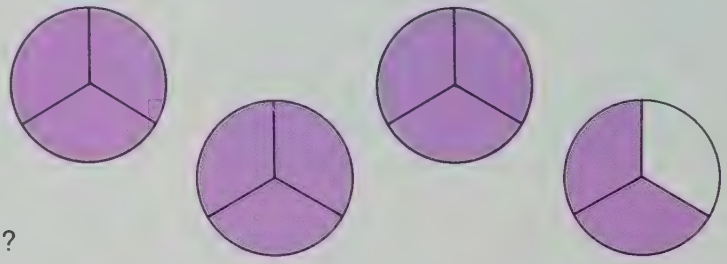
2. How many thirds are shaded?
How many wholes are shaded?

a How many more thirds than three wholes are shaded?

b Is the sentence $\frac{11}{3} = 3\frac{2}{3}$ true?

c Do $\frac{11}{3}$ and $3\frac{2}{3}$ name the same shaded area?



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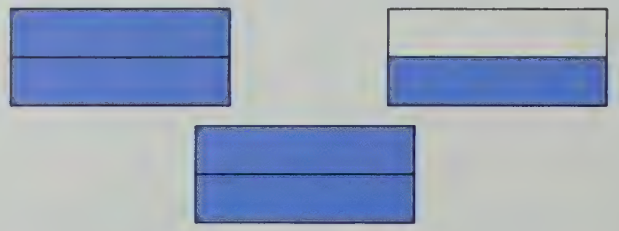
3. How many halves are shaded?
How many wholes are shaded?

a How many more halves than two wholes are shaded?

b Is the sentence $\frac{5}{2} = 2\frac{1}{2}$ true?

c Do $\frac{5}{2}$ and $2\frac{1}{2}$ name the same shaded area?



Numbers like $1\frac{1}{4}$, $3\frac{2}{3}$, and $2\frac{1}{2}$ are called *mixed numbers*.
Can you think of a reason why they are called this?

4. Which fractions can be renamed as mixed numbers?
Try to rename these fractions.

a $\frac{3}{2}$ **b** $\frac{5}{4}$ **c** $\frac{7}{4}$ **d** $\frac{3}{4}$ **e** $\frac{12}{15}$ **f** $\frac{7}{3}$

Draw diagrams if you need help.

Add. Put a star by any answer that is greater than 1.

BOYS do these.

1. $\frac{3}{4} + \frac{3}{4}$
2. $\frac{4}{7} + \frac{6}{7}$
3. $\frac{4}{5} + \frac{2}{5}$
4. $\frac{9}{10} + \frac{9}{10}$
5. $\frac{4}{6} + \frac{5}{6}$
6. $\frac{5}{8} + \frac{6}{8}$
7. $\frac{6}{8} + \frac{5}{8}$
8. $\frac{4}{8} + \frac{7}{8}$

GIRLS do these.

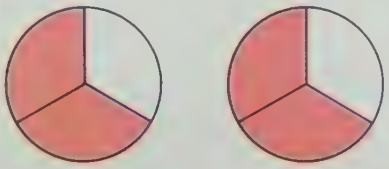
1. $\frac{4}{5} + \frac{4}{5}$
2. $\frac{2}{4} + \frac{3}{4}$
3. $\frac{7}{8} + \frac{2}{8}$
4. $\frac{3}{7} + \frac{6}{7}$
5. $\frac{4}{6} + \frac{4}{6}$
6. $\frac{6}{10} + \frac{9}{10}$
7. $\frac{5}{8} + \frac{4}{8}$
8. $\frac{7}{9} + \frac{3}{9}$

EVERYBODY do these.

Add. Put a star by any answer that is greater than 1 in these problems, too.

9. $\frac{2}{5} + \frac{4}{5}$
10. $\frac{5}{6} + \frac{5}{6}$
11. $\frac{2}{7} + \frac{6}{7}$
12. $\frac{7}{9} + \frac{5}{9}$
13. $\frac{6}{9} + \frac{2}{9}$
14. $\frac{1}{5} + \frac{3}{5}$
15. $\frac{1}{8} + \frac{2}{8}$
16. $\frac{4}{8} + \frac{5}{8}$

Draw a picture like this one to show just one of the problems you starred.



$\frac{2}{3} + \frac{2}{3} = \frac{4}{3}$ or $1\frac{1}{3}$

CHECKOUT

1. Which is more?

a $\frac{1}{4}$ or $\frac{3}{4}$ **b** $\frac{2}{3}$ or $\frac{1}{3}$ **c** $\frac{1}{6}$ or $\frac{3}{6}$ **d** $\frac{3}{5}$ or $\frac{2}{5}$

e $\frac{1}{9}$ or $\frac{7}{9}$ **f** $\frac{3}{10}$ or $\frac{2}{10}$ **g** $\frac{7}{8}$ or $\frac{5}{8}$ **h** $\frac{1}{2}$ or $\frac{2}{2}$

2. Order these fractions from smallest to largest.

$\frac{4}{8}$ $\frac{1}{8}$ $\frac{5}{8}$ $\frac{3}{8}$ $\frac{7}{8}$ $\frac{2}{8}$ $\frac{8}{8}$ $\frac{6}{8}$

3. Add these fractions.

a $\frac{3}{5}+\frac{1}{5}$ **b** $\frac{1}{4}+\frac{3}{4}$ **c** $\frac{3}{9}+\frac{6}{9}$ **d** $\frac{1}{3}+\frac{1}{3}$

e $\frac{2}{5}+\frac{2}{5}$ **f** $\frac{5}{9}+\frac{2}{9}$ **g** $\frac{4}{10}+\frac{5}{10}$ **h** $\frac{1}{2}+\frac{1}{2}$

4. Subtract these fractions.

a $\frac{3}{4}-\frac{1}{4}$ **b** $\frac{4}{5}-\frac{3}{5}$ **c** $\frac{8}{8}-\frac{5}{8}$ **d** $\frac{3}{5}-\frac{2}{5}$

e $\frac{7}{8}-\frac{0}{8}$ **f** $\frac{4}{4}-\frac{1}{4}$ **g** $\frac{3}{4}-\frac{3}{4}$ **h** $1-\frac{1}{3}$

5. Which is more?

a $\frac{1}{2}$ or $\frac{1}{4}$ **b** $\frac{1}{8}$ or $\frac{1}{4}$ **c** $\frac{1}{3}$ or $\frac{1}{6}$ **d** $\frac{1}{2}$ or $\frac{1}{8}$

7

GEOMETRY SHAPES

Lots of different shapes can be put together in groups because they are so much alike. For example, look at the shape of a book. Then look at the shape of a box.

How are they alike? How are they different?

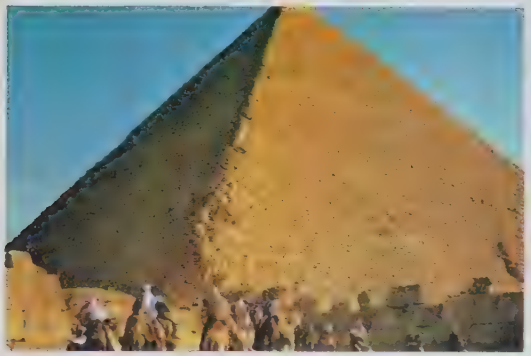
Now look at the door to your room. It's larger than a book or box. BUT does it have the same shape?

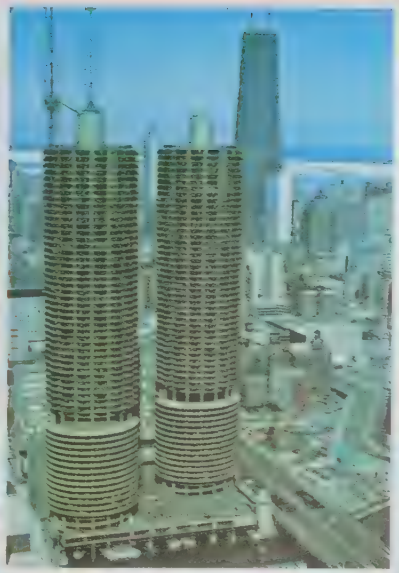
How much do you already know about shapes? Sort the following pictures into four groups. Each group will have shapes that are very much alike.

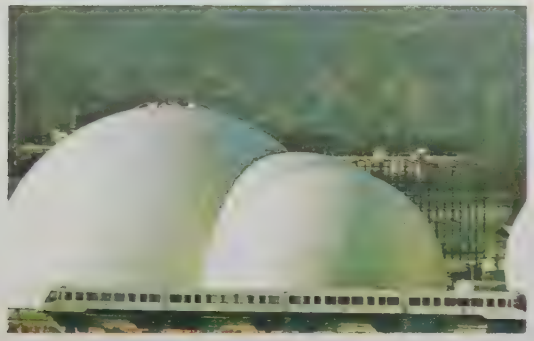
13. Can you guess the geometry name for each of these four groups?

We Design Space for a Purpose

What shapes are used?







Spheres and Cones We Live In

1. The great high ceiling of some buildings leaves one with a special feeling. Why do you think some buildings are built with large, high domes?

2. An igloo is shaped like a dome. What feeling do you think the Eskimos have inside their home? Why do you think they made it so small?

3. A ball-shaped object is a sphere. The dome can be thought of as a half-sphere. What other objects can you name that are spheres or half-spheres?

4. The Indian tepee is cone-shaped. The tops of African huts are also cone-shaped. What advantages does this shape have?

5. This exhibition building is curved like part of a sphere. What advantages does this shape have for an exhibit?

Living in Spaces with Flat Surfaces

1. Most of our living spaces have flat surfaces. Both skyscrapers and telephone booths have a common shape that is called a rectangular prism. Is the room you are in now something like a rectangular prism in shape? Name other things shaped like rectangular prisms.

2. Some modern homes have shapes that look like triangular prisms. Why do you think this shape is called a triangular prism? What part of a house sometimes looks like a triangular prism?

3. The old covered bridge includes two shapes. What are they?

4. Which of the following describe most of the rooms in your home?

   a The walls are flat surfaces.

   b The corners in the room are square.

   c The ceiling and the floor are about the same size and shape.

   d Opposite walls are the same distance apart.

Outdoor Living Spaces

1. Architects design outside space for outdoor living.
What shapes would you see if you were sitting in this plaza?

2. Parks are arranged to provide special kinds of living spaces. What shapes might you see here?

3. The natural setting in the woods is shown here. What shapes might you think of while sitting in the clearing among the trees?

4. What things near school should remind you of certain kinds of prisms? Can you think of things near home that look like rectangular prisms? that look like spheres?

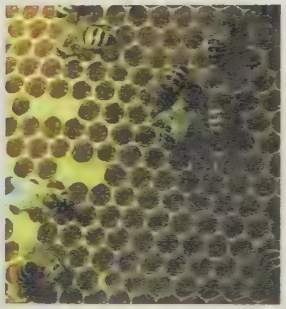
Animal Space

1. Animals build their living space in many different shapes. What shape is the oriole's nest like? Is a drop of water something like a sphere?

2. The hollow tree is shaped like a cylinder. What is the shape of a log? of a pile of logs? of a peppermint stick? of a pencil? What shape is the point of the pencil?

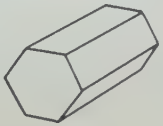
3. What shape does the robin's nest look like? What shape is the space for the robin before it is hatched?

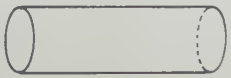
4. The beaver's den reminds us of many shapes. What part of the den reminds you of a cylinder? What part is like a sphere?



5. The larvae of the bee live in a shape like that of some pencils. How is the shape different from a cylinder?

6. Which animal houses do you think look something like each shape below?

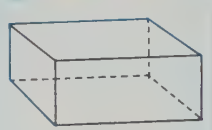




Look at the pictures on the right.

1. Why is ⓐ a rectangular prism?
2. Why is ⓑ not a rectangular prism?
3. Why is ⓒ not a rectangular prism?
4. Why is ⓓ not a rectangular prism?
5. What features do all rectangular prisms have? Name three.
6. Why do you think most rooms are shaped like rectangular prisms? What would be some advantages and disadvantages of a room shaped like a cylinder? like a pyramid (figure ⓒ)?

ⓐ



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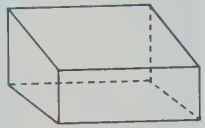

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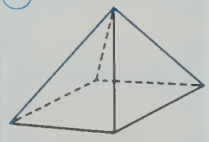

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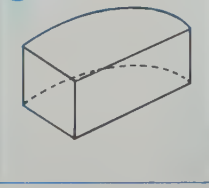
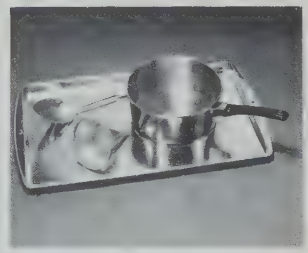


Shapes We Use

What are the shapes you see in each picture? Why do you think each object was shaped as it is?



The Shapes of Containers

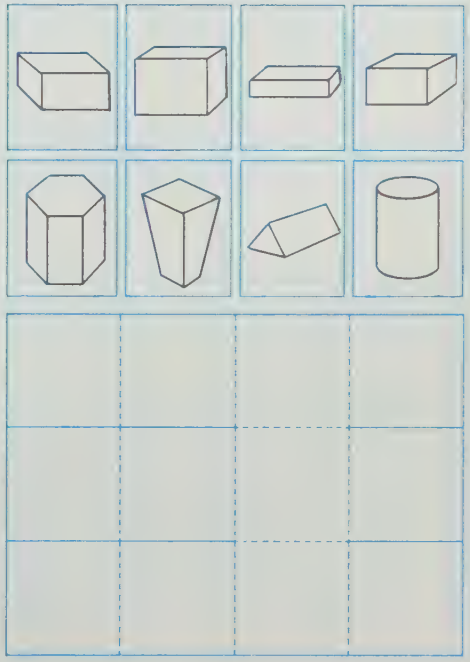
1. If each of the containers is filled, in what shape is the content of each?

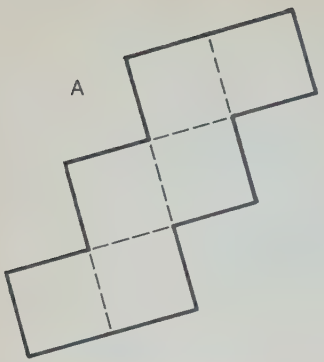
2. What are some advantages of using a rectangular prism as a container for milk? Why is the cone a good shape for the ice cream you buy?

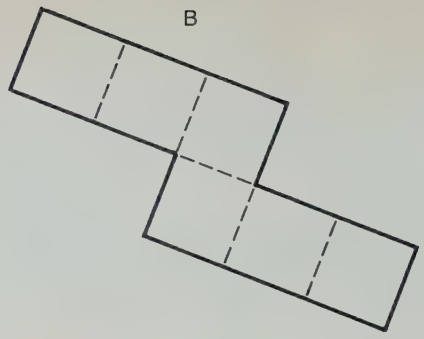
3. Most packing boxes come in shapes like these. Why do you think those shapes are used more often for packing than these?

4. Why do you think drinking glasses come in such a variety of shapes?

5. Cut and fold a piece of paper as shown on the right. Cut on solid lines and fold on dotted lines. Then try to shape the paper into a box. Does it look like the figures on this page?





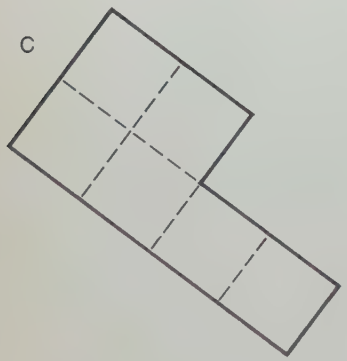


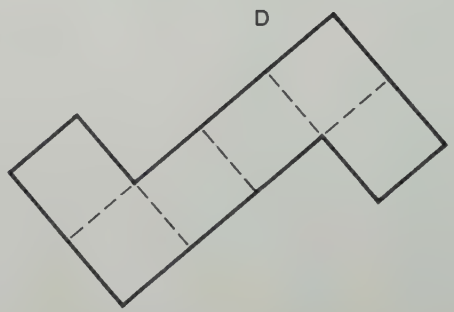
The figure that encloses these words is the pattern for a box. You will find that this closed box is a cube.

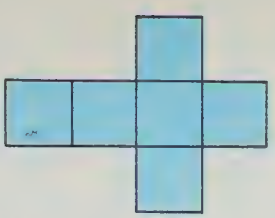
What is a cube? Trace the pattern on paper and cut it out. Then fold it carefully so that it forms a box. Tape the faces together so that the box is closed. What you have then is a cube.

You see other patterns on this page. Some of them are patterns for cubes. Others are not. Which ones are the patterns for cubes? Trace and cut out the patterns to find out. You may be surprised.

Are there any other patterns that will make cubes? Try to draw some that will.

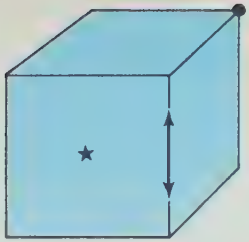






This is a pattern for a cube.

This is a picture of a cube that could be made from the pattern.



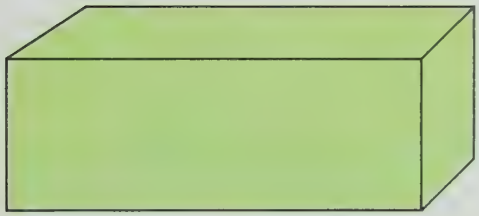
Look at a picture of a larger cube.

The • marks a corner, or vertex.
The ★ marks a flat surface, or face.
The ↕ marks an edge.

1. How many faces does a cube have?

a How many vertices does a cube have?

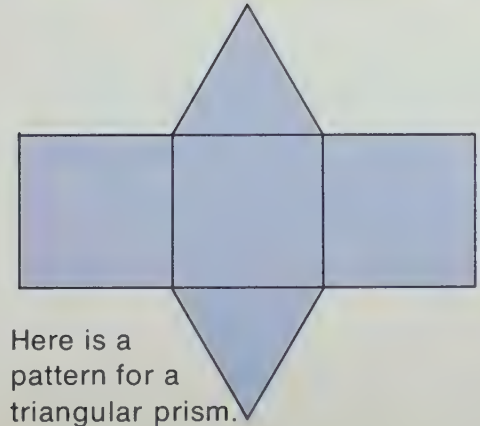
b How many edges does a cube have?



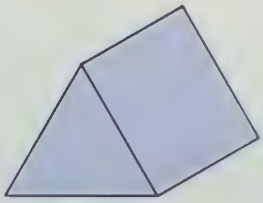
2. How many faces does a rectangular prism have?

a How many vertices?

b How many edges?



Here is a pattern for a triangular prism.



This is a picture of the triangular prism that could be made from this pattern.

3. How many faces does a triangular prism have?

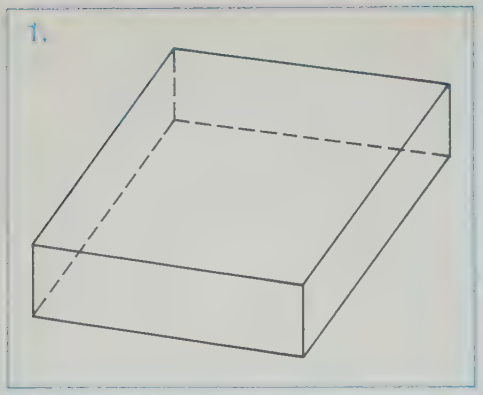
a How many vertices?

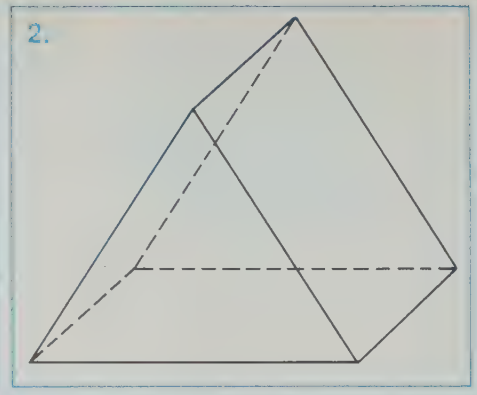
b How many edges?

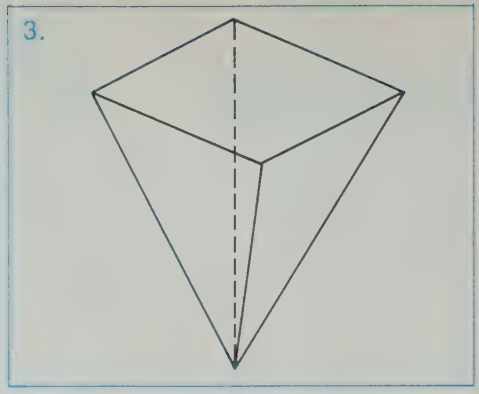
4. What is needed to form an edge?

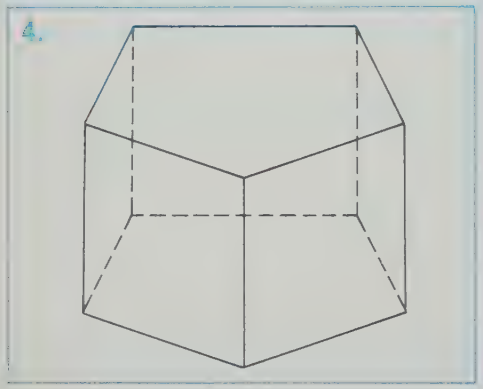
5. What is needed to form a vertex?

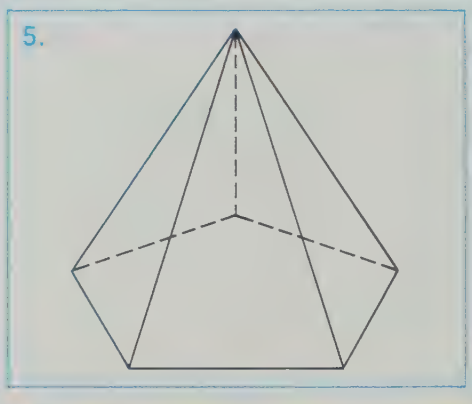
6. What are the least number of faces needed to form a prism? (Remember—a face is a flat surface.)

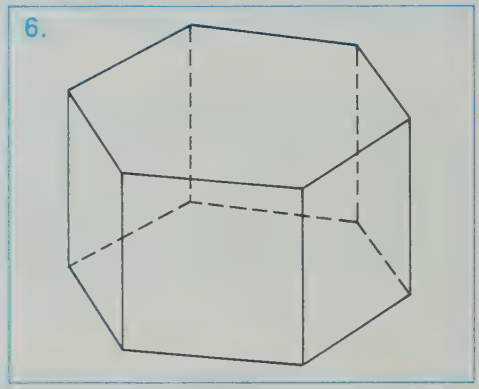












Six solid shapes are pictured above. The dotted lines show you what you could not see if these were pictures of models made of cardboard.

Make and complete a chart like this.

Figure	Number of faces	Number of edges	Number of vertices
1.			
2.			
3.			
*4.			
*5.			
*6.			

Remember—the dotted line shows the part you could not see if these models were made of cardboard. Figures 4, 5, and 6 are hard, but give them a try.

1. Take paper and a sharp pencil.
Trace one of the faces of a cube.
What figure have you just drawn?
Does the face of the cube fit the figure exactly?
Do all the faces fit the figure?

2. Now take a pyramid. Trace one of its faces.
What figure have you just drawn?
Does the face of the pyramid fit the figure?
Do all the faces fit the figure?

3. Select several objects you find in your room.
Trace as many different faces as you can.
Name any of the figures you trace.

4. So far, you have been tracing faces of solids with flat surfaces only.

   a Did you find any objects with curved surfaces to trace?

   b Can you trace the surface of a ball or any kind of sphere?
   Is the surface flat or curved?

   c Can you trace the curved surface of a cone? Does it have a flat surface?
   What shape is the flat surface?

   d Can you trace the curved surface of a cylinder? Does a cylinder have any flat surfaces? How many?
   What shape are the flat surfaces?

   e Figure out how a tin can is made.
   (Hint: It started out as flat pieces.)

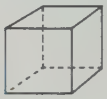
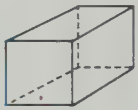
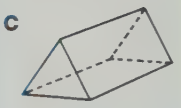
Flat-surface shapes are many times called plane figures.

You may want to use models to help you answer these questions.

1. How many faces are needed to form an edge on a prism?

2. What is the least number of faces a prism can have?

3. Copy and complete this chart.

SOLIDS	a 	b 	c 	d	e
Number of square faces	?	?	?	?	?
Number of rectangular faces (including squares)	?	?	?	?	
Number of triangular faces	?	?	?	?	
Number of circular faces	?	?	?		

4. This shape could be part of which solids in the chart above?

5. This shape could be part of which solids?

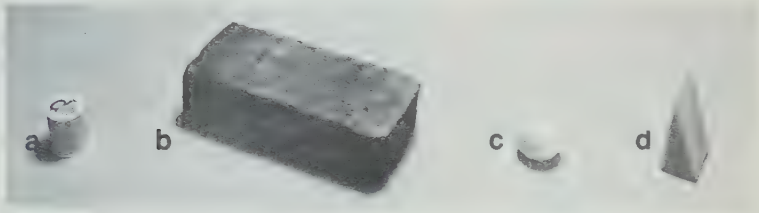
6. This shape could be part of which solids?

CHECKOUT

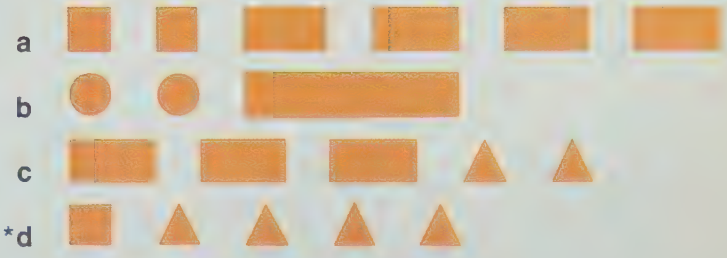
Which is it? Here are the names of the solids you will need for this page.

rectangular prism	cylinder	sphere
triangular prism	pyramid	cone

1. Name the geometric solid that best describes the shape of each of these objects.



2. Match the set of faces with the name of the solid.



3. **a** How many edges does a rectangular prism have? How many vertices?

   b How many edges does a triangular prism have? How many vertices?

   c How many edges does a sphere have? How many vertices?

8

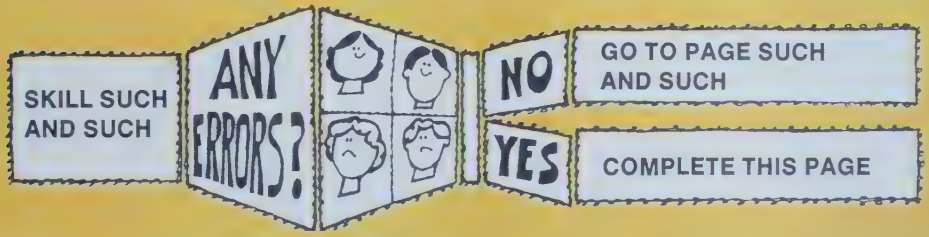
COMPUTATION +, −, AND ×

Your goal is to check out on skills you have had this year. And learn a thing or two. And then have time for FUN.

This chapter is DIFFERENT

It's made so that you can work through the chapter by yourself. But your teacher will want to give some advice. It's made so that you can skip over parts you can prove you know. It's made to help you with parts you don't know.

You'll be asked to work a couple of problems and then to check your answers. After that, you'll see a funny-looking chart that will look something like this:



This chart is a sort of road map. If you are honest with yourself and follow directions, you'll be finished in a short time. You will be proud to know what skills you have. You will be able to find those skills you need more practice with.

Everybody will start together. But that won't last long.

READY? SET! GO!

The newspaper said that 76 500 people lived in the city. Do you believe it?

Are there exactly 76 500 people in that city? When? Might there be more? Might there be fewer?

People move in. People move out. Babies are born. Some folks die. It would be a hard job to keep track of how many people lived in a city at any time.

The number is probably an *estimated* number. Our world is full of estimated numbers. Do you use them? How long does it take you to get home from school? Did you give an exact number or an estimate?

What time will the game start? Exact or estimate?

How many math problems did you work in the last two weeks? You might not even be able to estimate that number.

How much money will a new pair of shoes cost? If you really were buying a pair, you'd have to know the exact cost, including tax.

How much money will you spend next week? Could you tell *exactly* how much money you spent last week?

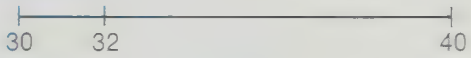
Sometimes an estimated answer is all you need. But sometimes you need an exact answer. Estimated answers can help you find out if your exact answer is reasonable.

Before you can estimate an answer, you must round each of the numbers you will compute. A round number is expressed as an even number of tens, or hundreds, or thousands, or ten-thousands, or . . . For example:

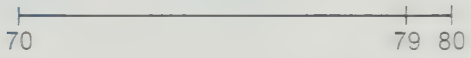
47 rounded to the nearest ten is 50.
167 rounded to the nearest hundred is 200.

Take another look at rounding. A number line can be a big help.

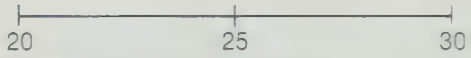
a Is 32 closer to 30 or 40?



b Is 79 closer to 70 or 80?



c Is 25 closer to 20 or 30?

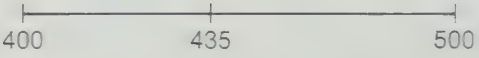


It's right in the middle, so round up to 30.

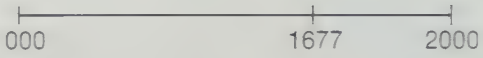
Be ready to shift gears.

d Is 180 closer to 100 or 200?

e Is 435 closer to 400 or 500?



f Is 1677 closer to 1000 or 2000?



g Is 4500 closer to 4000 or 5000?

Now see how rounding works for estimation.

$$\begin{array}{r} 59 \\ -\,83 \\ \hline ? \end{array}$$

Think

59 is closer to 60 than 50.
83 is closer to 80 than 90.
You know 60 − 80 is 140.

h The answer should be about 140. Is it?

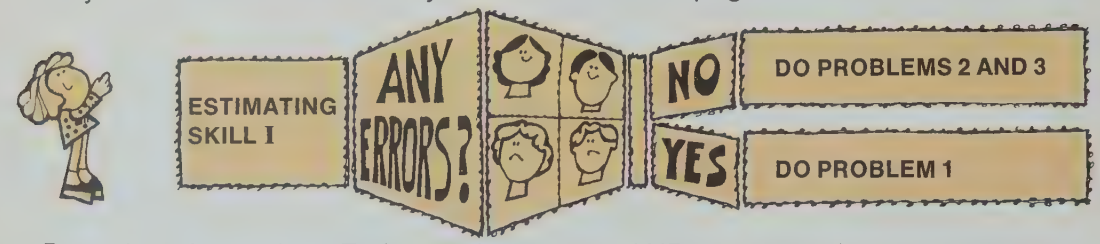
Estimate the answer. Do not compute.

a 59 people were there. 43 more came. How many in all?

b 78 cars in the lot. 39 drove off. How many left?

c There are 81 in each of 4 boxes. How many in all?

Check your answers with the key at the side of the page.



1. Round each number. Estimate the answer AND compute the exact answer too.

a
$$\begin{array}{r} 63 \text{ rounds to } 60 \\ +\,29 \text{ rounds to } \underline{30} \\ \hline ? \text{ (exact)} \qquad ? \text{ (estimate)} \end{array}$$

b
$$\begin{array}{r} 77 \text{ rounds to } 80 \\ -\,42 \text{ rounds to } \underline{40} \\ \hline ? \text{ (exact)} \qquad ? \text{ (estimate)} \end{array}$$

c
$$\begin{array}{r} 29 \text{ rounds to } 30 \\ \times\ 3 \qquad\qquad \underline{3} \\ \hline ? \qquad\qquad ? \end{array}$$

You generally do not round a 1-digit number when you multiply.

d $36 + 49 = ?$ **e** $93 + 47 = ?$ **f** $37 \times 5 = ?$

2. Think of a number.
Multiply it by 2.
Add 18 to the product.
Divide by 2.
Subtract the original number.
What is the result?
The result is always the same.
Check: try other numbers.

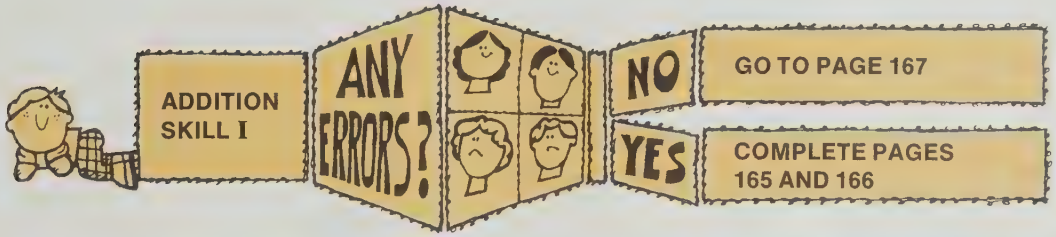
3. Multiply any number by 5.
Add 25 to the product.
Divide the sum by 5.
Subtract the number you started with.
Multiply that number by 3.
What is the result?
The result will always be the same.
Check: try other numbers.

a 100 **b** 40 **c** 320

Do these three addition problems.
First give an estimated sum. Then find the exact sum.

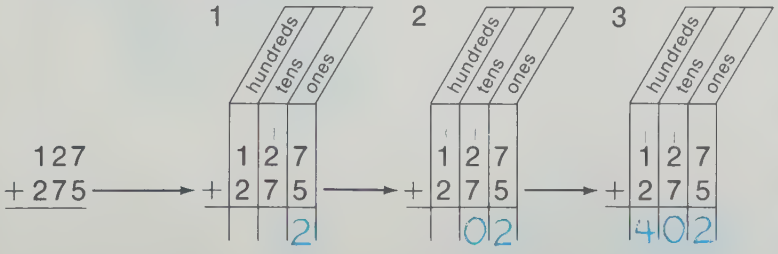
a	b	c
473	703	643
+389	+498	+675

Check your answers with the key on page 166.

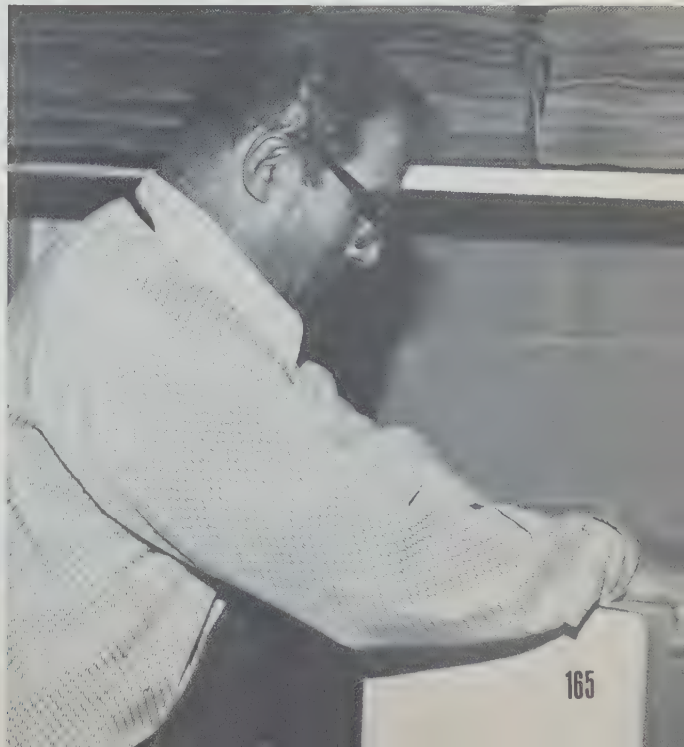


Tiger Transfer and Warehouse has tools in stock. They store the tools in their warehouse. They ship them out to customers when they have an order. They have a dock clerk who keeps a record of everything going in or out of the warehouse.

Here is a problem the dock clerk has to work. He really takes 3 steps to get the answer.



Is the dock clerk's answer a reasonable one?
How do you know?



You can check how reasonable the answer is by estimation. Round each addend to the nearest hundred and add.

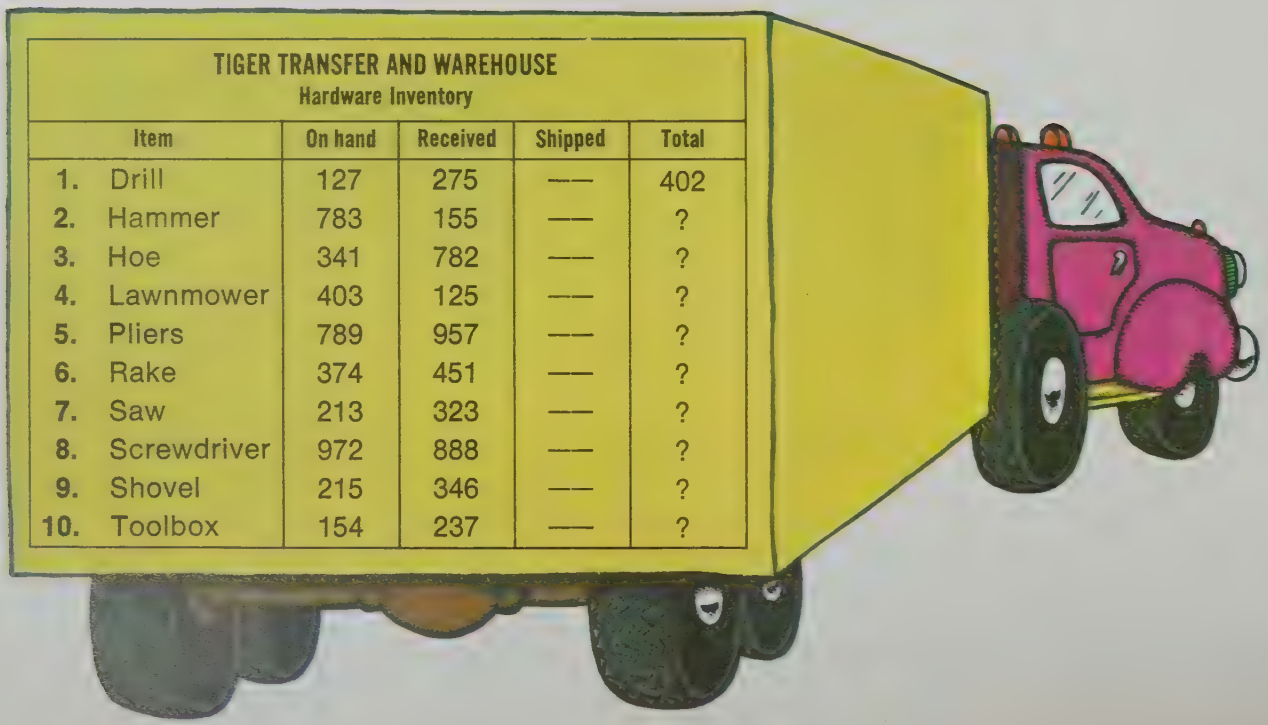
$$\begin{array}{r} 127 \\ +275 \\ \hline 402 \end{array} \longrightarrow \begin{array}{r} 100 \\ +300 \\ \hline ? \end{array}$$

a What do you get? Is 402 close to your estimate? Is 402 a reasonable answer?

b Here is a record the dock clerk is filling out. Figure the new totals for him by adding the numbers in the second and third columns. Then check how reasonable your totals are by rounding and estimating.

TIGER TRANSFER AND WAREHOUSE
Hardware Inventory

Item	On hand	Received	Shipped	Total
1. Drill	127	275	——	402
2. Hammer	783	155	——	?
3. Hoe	341	782	——	?
4. Lawnmower	403	125	——	?
5. Pliers	789	957	——	?
6. Rake	374	451	——	?
7. Saw	213	323	——	?
8. Screwdriver	972	888	——	?
9. Shovel	215	346	——	?
10. Toolbox	154	237	——	?



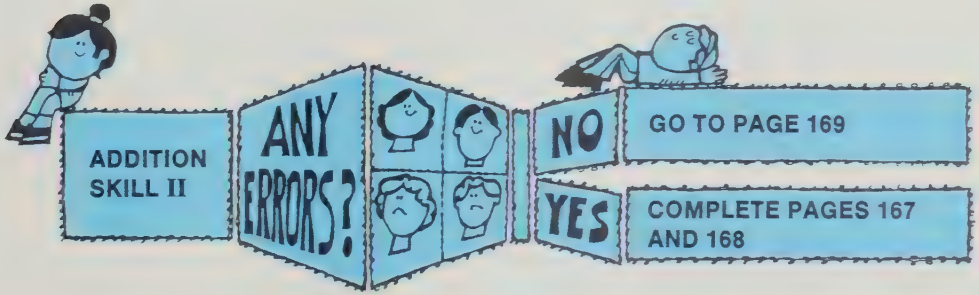
a 900; 862 **b** 1200; 1201 **c** 1300; 1318

The largest numbers you have had to add in this book are 3-digit numbers. Do you think you could add larger numbers too? Try it.

Here are three problems. First give an estimated sum. Then find the exact sum.

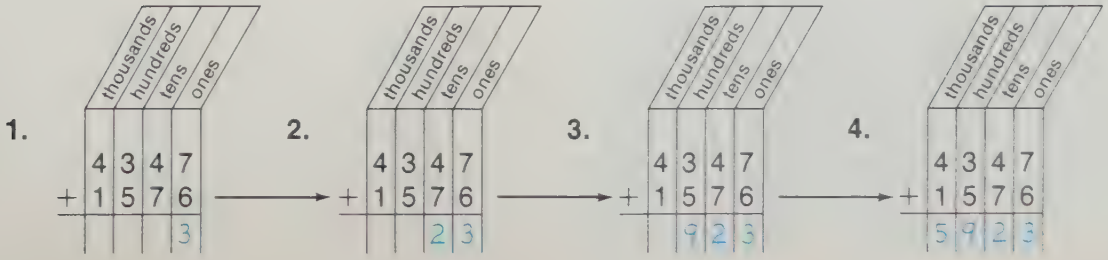
a	b	c
6219 +1582	4763 +8819	7279 +9321

Check your answers with the key on page 168.



4347 packages of nails are on hand in the warehouse. 1576 more packages are received. How many packages of nails does this total?

4347
+1576
?



Is this a reasonable answer?

You can find out by estimating.
Round to the nearest thousand and add.

4347	4000
+1576	+2000
5923	?

What do you think? Is 5923 reasonable?

Compare this example with the one on page 166.
How are the two alike? How are they different?

Try some problems like the example on this page.
Use estimation.
Decide whether your answers are reasonable.

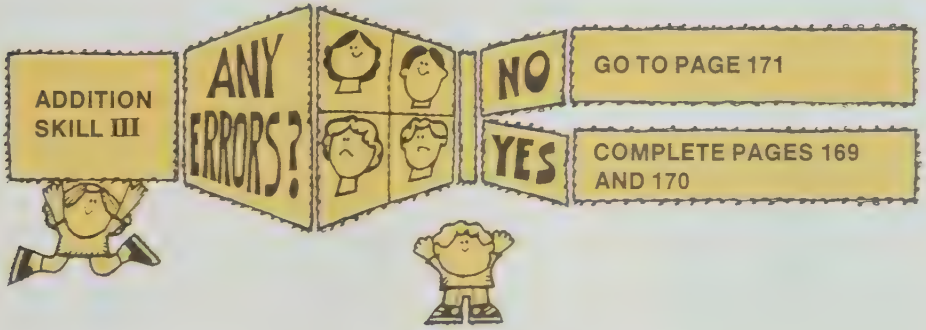
1.	2345 +6721	**2.**	5476 +4231	**3.**	4987 +3213
4.	1276 +3982	**5.**	5143 +2568	**6.**	8765 +5934
7.	6848 +7351	**8.**	2457 +9876	**9.**	3843 +5158
10.	5301 +4999	**11.**	6770 +1862	**12.**	6345 +9724

a 8000; 7801 **b** 14 000; 13 582 **c** 16 000; 16 600

Try these. Give an estimated sum and the exact sum.

a	b	c
436	7804	880
724	6123	4892
351	+5291	76
+832		+ 369

Check your answers with the key on page 170.



One apartment building has 153 people living in it. Another has 222. A third has 154. And another has 76. How many people live in these four buildings?

Study this problem. It is done in several steps.

	hundreds	tens	ones
153			
222			
154			
+ 76			
1	1	5	3
	2	2	2
	1	5	4
+		7	6
			5
2	1	5	3
	2	2	2
	1	5	4
+		7	6
		0	5
3	1	5	3
	2	2	2
	1	5	4
+		7	6
	6	0	5

Is this answer reasonable?

153	200
222	200
154	200
+ 76	+100
605	?

Why do you suppose the estimated sum and the exact sum are so far apart?

Here is some practice.
Give both estimated sums and exact sums.

1. 368 + 92 + 547

2. 476 + 108 + 354 + 285

3. 2832 + 3705 + 4400

4. 7661 + 6839 + 8009

5. 8 + 24 + 821 + 954

6. 728 + 931 + 640 + 351

7. 766 + 130 + 952 + 417

8. 6797 + 6318 + 9433

9. $56 + 781 + 449 + 8 = \underline{?}$

10. $7551 + 899 + 6420 = \underline{?}$

a 2300; 2343 **b** 19 000; 19 218 **c** 6300; 6217

Just for fun

ANNA is a girl's name. Spell it backward.
BOB is a boy's name. Spell it backward.

These words are called palindromes. Palindromes can also be numbers. Let's focus on the numbers.

Take this number.	15	
Reverse it.	51	
Add.	66	AHA! A palindrome!

Take another number.	85	
Reverse it.	58	
Add.	143	It doesn't work!
Try again. Reverse it.	341	
Add.	484	It does work! Another palindrome!

Take a larger number.	123	
Reverse it.	321	
Add.	444	But will it always work?

Sometimes you can find a number palindrome by reversing only once. Sometimes you must reverse twice. Sometimes you must reverse even more times.

Do you think there are some numbers that cannot be made into a palindrome? You can't check all of the numbers in the world, but you can check some.

Pick several 2-digit numbers. Can you find one that is not a palindrome? Don't forget you may have to reverse the digits more than once. Don't give up too soon.

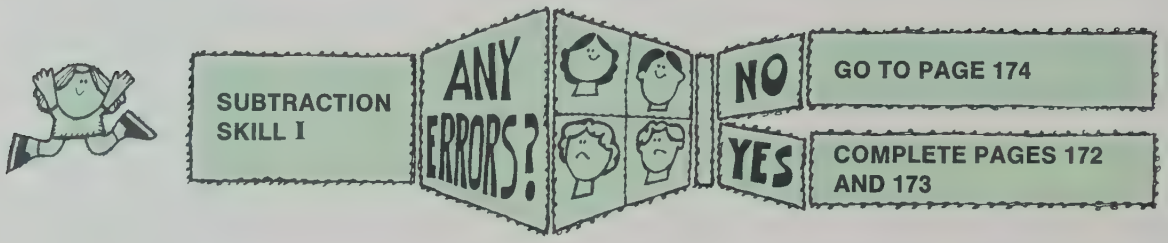
Now try some 3-digit numbers.

If you are really ready for adventure, try some 4-digit numbers.

Do these three subtraction problems. Give an estimated difference. Also give the exact difference.

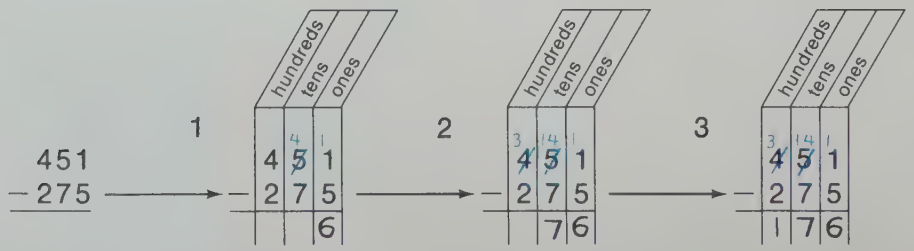
a	b	c
639	543	800
−246	−458	−271

Check your answers with the key on page 173.



Tiger Transfer and Warehouse also handles a number of houseware items. Some of these are shown on the inventory given on the next page.

Here is a sample problem that the dock clerk must work for goods being shipped. It is taken from the inventory sheet. The dock clerk finds the answer in three steps.



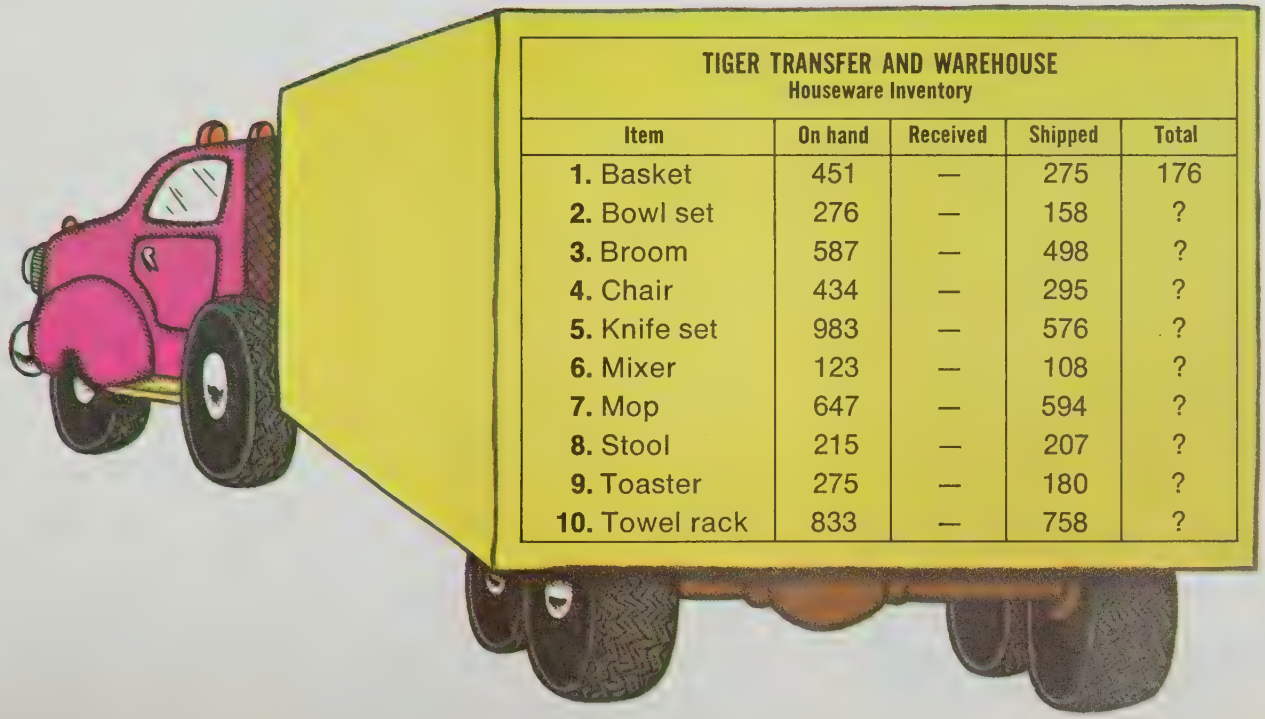
Is this answer reasonable? How can you tell?

You can use estimation to tell whether the answer is reasonable. Round to the nearest hundred and subtract.

$$\begin{array}{r} 451 \\ -\,275 \\ \hline 176 \end{array} \longrightarrow \begin{array}{r} 500 \\ -\,300 \\ \hline ? \end{array}$$

What do you think? Is the answer 176 reasonable?

Figure the new totals for the clerk. Subtract the numbers in the "Shipped" column from the totals in the "On hand" column. Then check how reasonable your totals are by rounding and estimating.



TIGER TRANSFER AND WAREHOUSE
Houseware Inventory

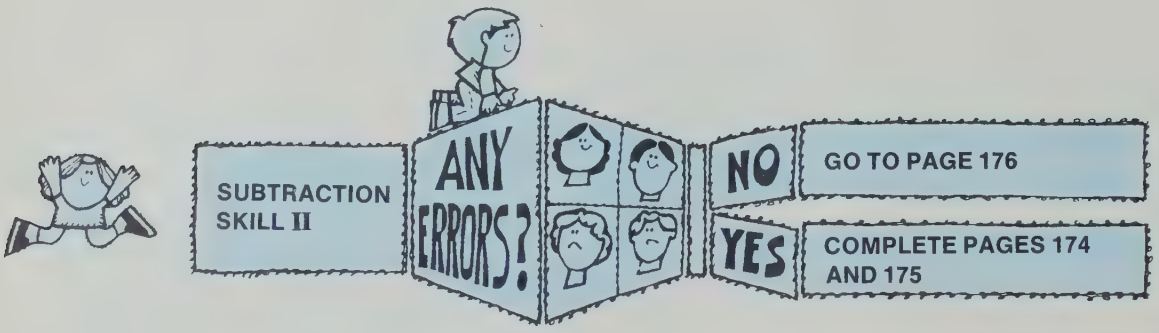
Item	On hand	Received	Shipped	Total
1. Basket	451	—	275	176
2. Bowl set	276	—	158	?
3. Broom	587	—	498	?
4. Chair	434	—	295	?
5. Knife set	983	—	576	?
6. Mixer	123	—	108	?
7. Mop	647	—	594	?
8. Stool	215	—	207	?
9. Toaster	275	—	180	?
10. Towel rack	833	—	758	?

a 400; 393 b 0; 85 c 500; 529

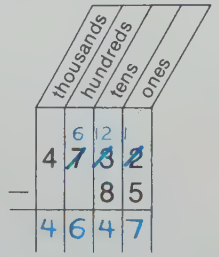
Try these. Give estimated differences and exact differences.

a $\begin{array}{r} 4280 \\ -\ 755 \\ \hline \end{array}$ **b** $6007 - 62$ **c** $8612 - 922$

Check your answers with the key on page 175.



The attendance at the hockey game was 4732. 85 of the people had free passes. How many people paid for tickets?



Do you notice how the numbers are lined up for subtracting? Are they lined up the same way as they were in addition? Why is the 8 in 85 under the 3 in 4732?

Now consider this: Is the answer 4647 reasonable? Let's estimate to find out. What do you think we should round to? Why?

$$\begin{array}{r} 4732 \\ -\ 85 \\ \hline 4647 \end{array} \longrightarrow \begin{array}{r} 4700 \\ -\ 100 \\ \hline ? \end{array}$$

Well, is the answer reasonable?

Here are some exercises. Be sure to check whether your answers are reasonable.

1. $\begin{array}{r} 5974 \\ -\ 885 \end{array}$ **2.** $\begin{array}{r} 7113 \\ -\ 672 \end{array}$ **3.** $\begin{array}{r} 3212 \\ -\ 633 \end{array}$

4. $157 - 89 = \underline{?}$ **5.** $4250 - 315 = \underline{?}$

6. $7335 - 426 = \underline{?}$ **7.** $6389 - 693 = \underline{?}$

8. $4328 - 797 = \underline{?}$ ***9.** $71\,463 - 2494 = \underline{?}$

***10.** $13\,275 - 8066 = \underline{?}$ ***11.** $643\,545 - 6435 = \underline{?}$

***12.** A human being lives about 27 010 days in a lifetime. If today is your ninth birthday, you have already lived 3287 days. How many days would this leave you? (Do you think everyone lives 27 010 days? What do you think 27 010 days really means in this problem?)

a 3500; 3525 b 5900; 5945 c 7700; 7690

Just for Fun

Do these puzzles. Test several numbers to make sure they really work. Then try to figure out why they work. If you can figure them out—GREAT. If you can't figure them out, just enjoy the puzzle itself.

Think of a number from 1 through 8.
Add 9 to get a sum.
Double the sum.
Divide by 2.
Subtract the number you picked.
The last number is always 9.

WHY?

Think of a number from 1 through 9.
Add 1 and multiply by 3.
Add 2 and multiply by 4.
Add 1 and divide by 3.
Add 1 and divide by 4.
Subtract the number you picked.
The answer is always 2.

WHY?

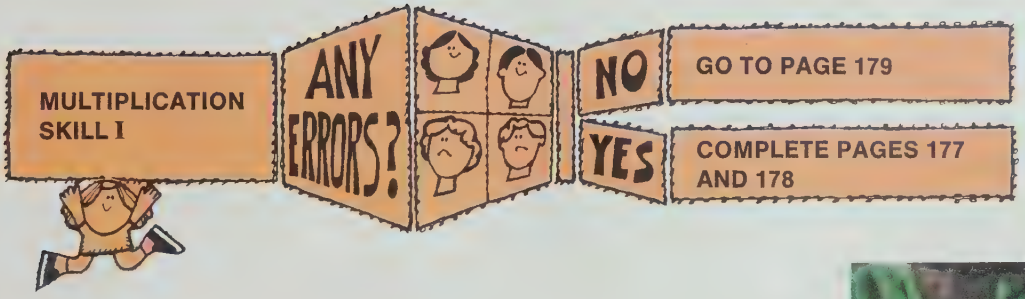
And just one more.
Don't worry about the "why" on this one.

Take any number. Write it down. Reverse the order of the digits to get a second number. Subtract the smaller number from the larger number. That answer will *always* be exactly divisible by 9.

Can you work problems like these?
See if you can get the right answers.

a	b	c
45 × 9	743 × 5	409 × 7

Check your answers with the key on page 178.



Myrtle is in school 35 hours a week. How many hours is this in 6 weeks?

$$\begin{array}{r} 35 \\ \times\ 6 \\ \hline 30 \\ 180 \\ \hline 210 \end{array} \quad \begin{array}{l} \\ \\ 6 \times 5 \\ 6 \times 30 \\ \\ \end{array}$$

Why multiply 6×5 to get 30?
Why multiply 6×30 to get 180?
How do you get 210?

GOT THE IDEA? Try doing the problems on page 178.

1. 43×6	**2.** 58×3	**3.** 91×7	**4.** 27×9	**5.** 49×4	**6.** 68×8
7. 156×5	**8.** 732×6	**9.** 271×5	**10.** 505×7	**11.** 464×8	**12.** 340×9
13. 390×4	**14.** 250×9	**15.** 278×7	**16.** 987×6	**17.** 807×5	**18.** 613×8

19. There are 479 children in Morton's school. If each child sells 5 tickets to the school fashion show, how many tickets will this be?

20. 789 people are sitting in a movie watching the show. Each has paid $3 to get in. How much money is this?

21. Copy and complete this chart.

How many in all?	2 in each box	4 in each box	5 in each box	6 in each box	8 in each box	10 in each box
3 boxes	a	b	c	d	e	f
5 boxes	g	h	i	j	k	l
7 boxes	m	n	o	p	q	r
9 boxes	s	t	u	v	w	x

a 405 b 3715 c 2863

Now see if you can get the right answers to these problems.

a	b	c
72 × 80	429 × 30	980 × 70

Check your answers with the key on page 180.

In the last section you learned that Myrtle is in school 35 hours a week. How many hours does she spend in school in 30 weeks?

$$\begin{array}{r} 35 \\ \times\ 30 \\ \hline 150 \\ 900 \\ \hline 1050 \end{array}$$

(30 × 5) Why multiply 30 × 5?

(30 × 30) Why multiply 30 × 30?

← Where did that come from?

Here is some practice for you.

1.	2.	3.	4.	5.	6.
36 × 40	51 × 70	29 × 30	63 × 80	35 × 20	76 × 90

7.	8.	9.	10.	11.	12.
614 × 80	892 × 70	425 × 60	503 × 50	972 × 40	780 × 30

There is a shortcut for multiplying tens.
The pattern at the right will give you a clue.

$1 \times 10 = 10$

$5 \times 10 = 50$

$9 \times 10 = 90$

$10 \times 10 = 100$

$15 \times 10 = 150$

$18 \times 10 = 180$

$100 \times 10 = 1000$

$125 \times 10 = 1250$

THINK 3 tens.

$1 \times 30 = 30$
No surprise.

$5 \times 30 = 150$
THINK $(5 \times 3) \times 10$.

$9 \times 30 = 270$
THINK $(9 \times 3) \times 10$.

$15 \times 30 = 450$
THINK $(15 \times 3) \times 10$.

Look at a more difficult problem.

$$\begin{array}{r} 469 \\ \times\ 80 \\ \hline \end{array}$$

This can be thought of as

$$\begin{array}{r} 469 \\ \times\ 8 \text{ tens} \\ \hline \end{array}$$

You certainly know how to do that. There is only one thing you MUST remember. You are multiplying tens. The answer you get in the shortcut must be multiplied by 10. That's easy enough.

Try the shortcut on these.

1. $\begin{array}{r} 73 \\ \times 20 \\ \hline \end{array}$ **2.** $\begin{array}{r} 49 \\ \times 30 \\ \hline \end{array}$ **3.** $\begin{array}{r} 163 \\ \times\ 40 \\ \hline \end{array}$ **4.** $\begin{array}{r} 52 \\ \times 50 \\ \hline \end{array}$

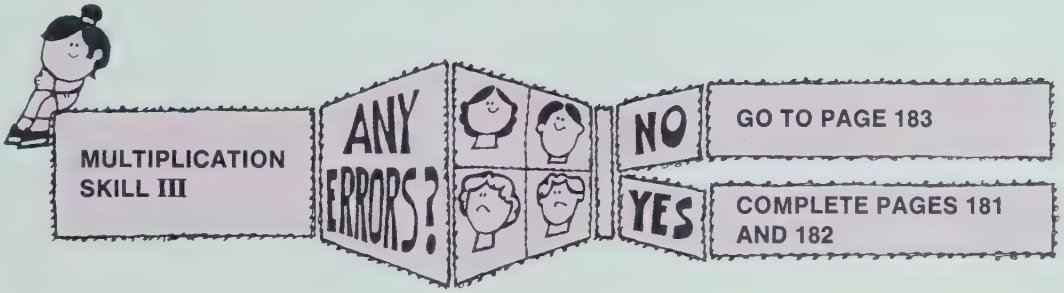
5. $\begin{array}{r} 348 \\ \times\ 60 \\ \hline \end{array}$ **6.** $\begin{array}{r} 96 \\ \times 70 \\ \hline \end{array}$ **7.** $\begin{array}{r} 587 \\ \times\ 80 \\ \hline \end{array}$ **8.** $\begin{array}{r} 607 \\ \times\ 90 \\ \hline \end{array}$

a 5760 b 12 870 c 68 600

Try these problems. Give both estimated and exact answers.

a	b	c
78	14	86
$\times 64$	$\times 92$	$\times 57$

Check your answers with the key on page 182.



Myrtle goes to school 36 weeks out of the year. How many hours of school is this? (Remember—she goes 35 hours a week.)

Myrtle did the problem this way →

$$\begin{array}{rl} 35 & \\ \times 36 & \\ \hline 30 & 6 \times 5 \\ 180 & 6 \times 30 \\ 150 & 30 \times 5 \\ 900 & 30 \times 30 \\ \hline 1260 & \text{Is this reasonable?} \end{array}$$

Her mom checked her work. She did it this way →

$$\begin{array}{r} 35 \\ \times 36 \\ \hline 210 \\ 1050 \\ \hline 1260 \end{array}$$

Both Myrtle and her mom had estimated the answer. →

$$\begin{array}{r} 40 \\ \times 40 \\ \hline 1600 \end{array}$$

The estimate and the exact answer aren't very close. Can you figure out why? At least your estimate tells you that you haven't made a big mistake. An answer of 12 600 or 126 would be a big mistake!

When you do multiplication, you can use the form that Myrtle or her mom used.

Compare your estimate and exact product on this one.

EXACT PRODUCT (ONE WAY OF WRITING THE PROBLEM)		(ANOTHER WAY)		ESTIMATE (FOR BOTH FORMS)
79		79		80
$\times 34$		$\times 34$		$\times 30$
36	4×9	316	4×79	?
280	4×70	2370	30×79	
270	30×9	?		
2100	30×70			
?				

In finding the estimate, what place do we round 79 to? Why? What place do we round 34 to? Why?

What is the exact product? Is it close to 2400?

Here is some practice. Find both the exact product and the estimated product.

1. 46 $\times 31$	**2.** 51 $\times 65$	**3.** 29 $\times 72$	**4.** 94 $\times 62$	**5.** 87 $\times 54$	**6.** 38 $\times 97$
7. 74 $\times 62$	**8.** 92 $\times 43$	**9.** 59 $\times 24$	**10.** 68 $\times 81$	**11.** 48 $\times 32$	**12.** 87 $\times 54$

a 4800; 4992 **b** 900; 1288 **c** 5400; 4902

This page is for everyone

So far this year you have done 182 pages of mathematics (but you're not through yet). If there are 26 kids in your class, how many pages in all have been done? (Or have you done that many?)
How many in all were done by the 6 people in the first row?
How many in all were done by the other 20?
How many in all were done by the 26?

$$\begin{array}{r} 182 \\ \times\ 6 \\ \hline 1092 \end{array} \qquad \begin{array}{r} 182 \\ \times\ 20 \\ \hline 3640 \end{array} \qquad \begin{array}{r} 182 \\ \times\ 26 \\ \hline 1092 \\ 3640 \\ \hline 4732 \end{array}$$

6×182
20×182

In the third problem, why did we multiply 6×182?
Why did we multiply 20×182?
How did we get 4732?

Try doing this problem yourself. Use the shortcut.

$$\begin{array}{r} 563 \\ \times\ 54 \\ \hline ? \end{array}$$

What answer did you get? Let's go through the problem together step by step.

$$\begin{array}{r} 563 \\ \times\ 54 \\ \hline 2252 \\ 28150 \\ \hline 30402 \end{array}$$

How do we get 2 252?
Where does 28 150 come from?
Explain 30 402.

Do you think you can work problems like this by using the shortcut?
Try it. Give both estimated and exact answers.

Multiply. Use the shortcut.

1. 48 × 25	**2.** 96 × 37	**3.** 818 × 94	**4.** 775 × 62	**5.** 927 × 98	**6.** 84 × 67
7. 67 × 51	**8.** 708 × 77	**9.** 707 × 89	**10.** 393 × 71	**11.** 675 × 48	**12.** 961 × 65

13. Mr. Zee worked 8 hours a day, 5 days a week, 50 weeks a year. How many hours does he work in one year?

14. Mr. Zee is the kind of man who needs 8 hours of sleep every night. If he gets that much sleep every day, how many hours does he sleep in a week? in the 52 weeks during a year?

15. Mr. Zee watched TV 4 hours every day in the year. How many hours does he spend watching TV in a year?

If you are brave, try these. You don't have to do them.

16. About how many hours of TV do you watch in a year's time?

17. How many hours do you spend in school each day? each week?

18. How many hours do you spend in school during a school year? (Assume 180 days in one school year.)

Before you go on, everyone should study these pages.

Copy the problems and multiply.

a	9	7	**b**	3	12	**c**	15	23	**d**	57	97
	×7	×9		×12	× 3		×23	×15		×97	×57

Look at each pair of answers. What can you say about changing the order of the numbers you multiply?

Are you wondering why this is important to know?
Try working this problem.

$$\begin{array}{r} 7 \\ \times 65\,432 \end{array}$$

Or would you rather work this one?

$$\begin{array}{r} 65\,432 \\ \times \quad 7 \end{array}$$

Look at this problem.
Do you know what the parentheses ( ) mean?

$$3 \times (2 \times 4) = ?$$

Parentheses always say "Do me first." So you multiply 2×4 first.

$3 \times (2 \times 4) = 3 \times 8$
$3 \times (2 \times 4) = 24$

Do the problem another way. You do it yourself.

$$(3 \times 2) \times 4 = ?$$

Which two numbers did you multiply first?
Did you get the same answer?

Here are some more problems for you to do.

a	$(7 \times 9) \times 3 = ?$	$7 \times (9 \times 3) = ?$
b	$(15 \times 25) \times 4 = ?$	$15 \times (25 \times 4) = ?$
c	$(25 \times 17) \times 31 = ?$	$25 \times (17 \times 31) = ?$
d	$(46 \times 21) \times 38 = ?$	$46 \times (21 \times 38) = ?$

Look at each pair of answers. What can you say about changing which two numbers you multiply first?

Sometimes it's nice to know ideas like these.
Can you do the following problem in your head?
Don't use pencil and paper.

$$4 \times 7 \times 25 = ?$$

You can do this problem mentally if you know what to do. How much is 4×25? What is 7×100?
Does this give us the right answer?
Can we work the problem this way?

$4 \times 7 \times 25 = ?$	This is what we start with.
$7 \times 4 \times 25 = ?$	What are we doing in this step?
$7 \times (4 \times 25) = ?$	Explain this. Does this tell how we just found the answer?

If you have three numbers to multiply, you can multiply them in any order you wish.
Sometimes hard problems become easy this way.
Try doing these exercises in your head.

1. $5 \times 9 \times 2 = ?$	**2.** $9 \times 3 \times 3 = ?$	**3.** $6 \times 25 \times 4 = ?$
4. $2 \times 7 \times 4 = ?$	**5.** $2 \times 7 \times 50 = ?$	**6.** $20 \times 5 \times 9 = ?$

Just for Fun

1. Find the answer to each of these problems.

$(1 \times 9) + 2 = \underline{?}$

$(12 \times 9) + 3 = \underline{?}$

$(123 \times 9) + 4 = \underline{?}$

$(1234 \times 9) + 5 = \underline{?}$

$(12\,345 \times 9) + 6 = \underline{?}$

$(123\,456 \times 9) + 7 = \underline{?}$

$(1\,234\,567 \times 9) + 8 = \underline{?}$

$(12\,345\,678 \times 9) + 9 = \underline{?}$

DOES THE PATTERN CONTINUE?

2. Here's another multiplication pattern.

$6 \times 7 = \underline{?}$

$66 \times 67 = \underline{?}$

$666 \times 667 = \underline{?}$

$6666 \times 6667 = \underline{?}$

3. Make an array of nine dots like this. Draw no more than 4 line segments that pass through each of the 9 points once and only once. Don't lift your pencil!

CHECKOUT

This should be painless.

Compute.

1. $\begin{array}{r} 765 \\ +586 \\ \hline ? \end{array}$ You did this on page 165.

2. $\begin{array}{r} 8964 \\ +1147 \\ \hline ? \end{array}$ You did this on page 167.

3. This is like the hardest one on page 169.

$$\begin{array}{r} 62 \\ 8105 \\ 681 \\ +1500 \\ \hline ? \end{array}$$

4. $\begin{array}{r} 900 \\ -509 \\ \hline ? \end{array}$ You had no trouble with this on page 172. And this was on page 174. $\begin{array}{r} 4062 \\ -\ 158 \\ \hline ? \end{array}$

These started on page 177.

5. $\begin{array}{r} 562 \\ \times\ 7 \\ \hline ? \end{array}$ **6.** $\begin{array}{r} 861 \\ \times\ 40 \\ \hline ? \end{array}$ **7.** $\begin{array}{r} 57 \\ \times 63 \\ \hline ? \end{array}$ **8.** $\begin{array}{r} 452 \\ \times\ 32 \\ \hline ? \end{array}$

And they ended on page 184.

9. You found on page 185 that 52×46 had the same product as 46×52. But what is the product?

10. Your last job was to multiply $20 \times 15 \times 5$. You made the job easier by picking whichever two numbers you wanted to multiply first. Do that job again.

9

DIVISION

1. The members of the Hideway Club decided to build a clubhouse. Someone gave them 78 pieces of old lumber. They could carry 6 boards each trip if they worked together as they moved the lumber to their building site. About how many trips do you think it would take them to move the 78 boards?

   The club members started to solve the problem this way:

	78	
	− 6	1 trip
Boards remaining	72	
	− 6	1 trip
Boards remaining	66	
	− 6	1 trip
Boards remaining	60	
	− 6	1 trip
Boards remaining	54	

   Keep subtracting 6s, one at a time, until all the boards are moved. Count the trips. How many?

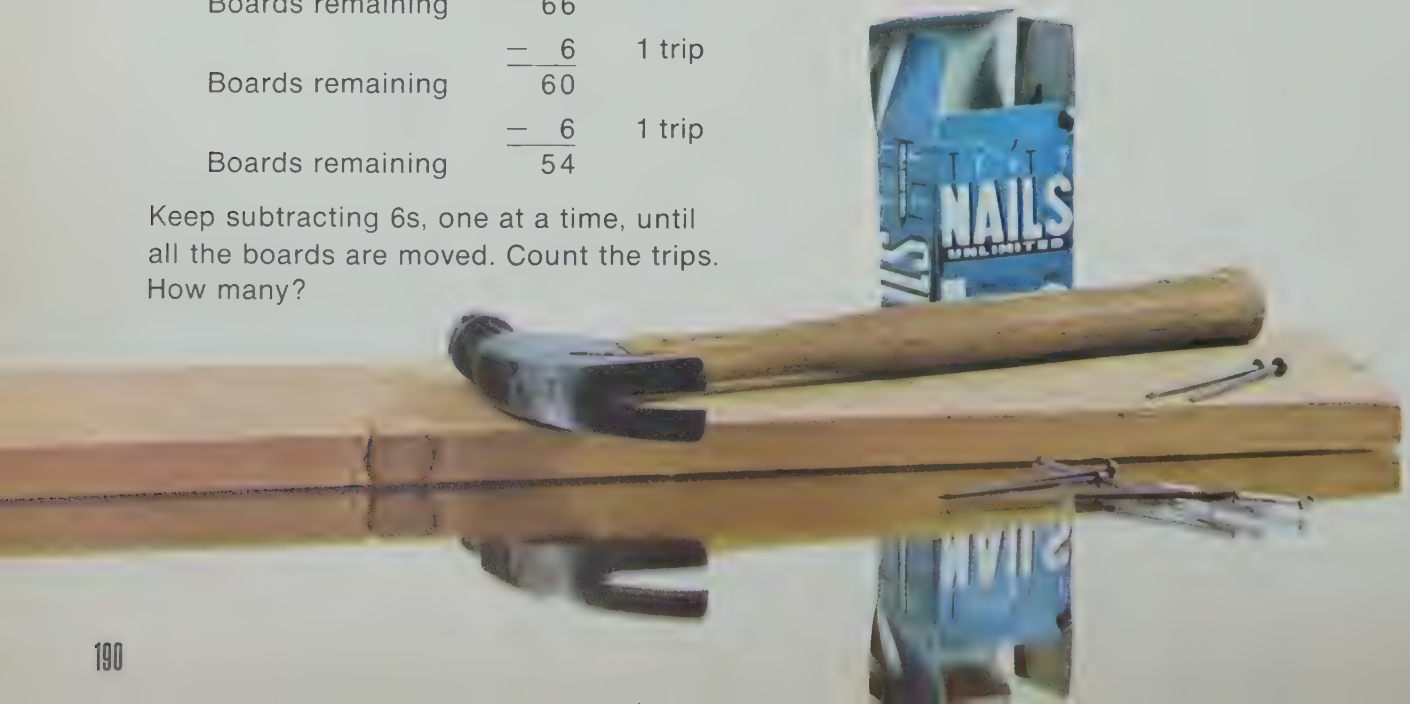
2. How many sixes are there in 78? You found out by subtracting. You could have used the operation of division.

   Subtracting the same number again and again is a very long method of division.

3. Or do you already know how to divide? What's 837 ÷ 6?

GOAL

In this chapter
you will learn about division.
You will find a shorter method
to solve a math sentence like 78 ÷ 6 = ■.



You solved a division problem by using repeated subtraction.

Try another one.

The City Cab Company received a shipment of 68 new tires.
How many cabs could get 4 new tires?

THINK How many 4s in 68?

68	
− 4	1 four.
64	Any more fours?
− 4	1 four.
60	Any more fours?

If you subtract 1 four at a time, it will take you forever. Start over.

THINK How many 4s in 68?
Are there 6 fours?

68	
− 24	6 fours are 24.
44	Any more fours?

Many more 4s remain. Right? Start over.

THINK How many 4s in 68?
Are there 8 fours?

68	
− 32	8 fours are 32.
36	Any more fours?

That's better, but try one more time.

THINK How many 4s in 68?
Are there 10 fours?

68	
− 40	10 fours are 40.
28	How many fours remain?
− 28	7 fours! Right?
0	Zero remains.

How many 4s in 68?
Using 10 fours worked well, didn't it?

1

Find the answers to these problems.

a How many 3s in 57?
b How many 4s in 60?
c How many 5s in 90?
d How many 3s in 51?
e How many 4s in 84?
f How many 2s in 92?
g How many 5s in 75?
h How many 6s in 78?
i How many 7s in 77?
j How many 8s in 96?
k How many 9s in 99?
l How many 7s in 91?

2

The problems so far show that you need to know the multiplication facts. Do you need to review multiplication?

find out

a 3×5
b 2×9
c 4×5
d 3×7
e 8×6
f 6×4
g 7×7
h 4×9
i 3×4
j 8×5
k 4×7
l 5×6
m 7×9
n 6×6
o 8×8
p 7×5
q 8×3
r 9×6
s 8×9
t 9×9
u 6×9
v 8×7
w 7×4
x 3×9

3

Replace the box to make these true.

a $\square \times 3 = 21$
b $\square \times 7 = 42$
c $8 \times \square = 16$
d $\square \times 9 = 27$
e $8 \times \square = 56$
f $\square \times 9 = 81$
g $5 \times \square = 45$
h $\square \times 3 = 18$
i $\square \times 5 = 25$
j $8 \times \square = 32$
k $7 \times \square = 49$
l $9 \times \square = 18$
m $6 \times \square = 54$
n $\square \times 9 = 63$
o $3 \times \square = 24$

What is the largest number that will make this true?

Example: $\square \times 7 < 30$

We can replace the box with 0, 1, 2, 3, or 4.

$0 \times 7 < 30$, $2 \times 7 < 30$, $3 \times 7 < 30$.

But 4 is the largest replacement that makes a true sentence.

Your answer: $4 \times 7 < 30$.

Try these. Find the largest number that makes these true.

a $\square \times 5 < 24$ **b** $\square \times 7 < 64$ **c** $\square \times 6 < 47$

d $\square \times 8 < 34$ **e** $\square \times 6 < 58$ **f** $\square \times 9 < 65$

10 fives is another way of writing 10×5. Both are multiplication situations. Find the answers.

a 10×3	**b** 20×2	**c** 10×5	**d** 30 fours	**e** 40×6
f 70×3	**g** 60×5	**h** 50×7	**i** 40×4	**j** 40 fives
k 100×3	**l** 200×4	**m** 500 threes	**n** 800×5	**o** 700×6
p 600×9	**q** 400 eights	**r** 900×8	**s** 800×9	**t** 300×9
u 10×9	**v** 90×7	**w** 100 nines	**x** 800×7	**y** 80 sevens

Let's go back to division situations and try another problem.

1. Warren is in charge of food for the class party. He plans to get 96 sandwiches. He thinks each person will eat 4. How many people can he serve if each person eats 4 sandwiches? Can he serve 10?

THINK How many 4s in 96?

96	
−40	10 fours.
56	56 remains. Are there 10 more fours?
−40	10 fours.
16	16 remains. Are there 10 more fours?
−16	4 fours.
0	Any more fours?

a How many people can be served in all if each eats 4 sandwiches?

b Are there any sandwiches that remain?

c The number sentence to show this situation is $96 \div 4 = \blacksquare$.

Some people from another class join the party. So Warren decides to allow 3 sandwiches for each person instead of 4. How many people can he serve if each person eats 3 sandwiches?

THINK How many 3s in 96?

96	
−30	10 threes.
66	Are there 10 more threes?
	You complete the computation.

a How many people can be served in all if each eats 3 sandwiches?

b Are there any sandwiches that remain?

c The number sentence for this problem is $96 \div 3 = \blacksquare$.

Try these yourself

1. How many 4s in 92?
2. How many 5s in 195?
3. How many 7s in 553?
4. How many 6s in 438?
5. How many 3s in 135?
6. How many 9s in 747?
7. How many 8s in 656?
8. How many 7s in 378?
9. How many 6s in 198?

10. Michael decided to sell candy to earn money. He can buy one large bag of candy that has 250 pieces for $2.50. He thought he could put 7 together and sell each small package for 10¢. How many small packages can he fill from the large bag?

THINK: How many 7s in 250?

	250	
Try 20.	− 140	20 sevens.
	110	Any more sevens?
Try 10 more.	− 70	10 sevens.
	40	Any more sevens?
	− 35	5 sevens.
	5	Any more sevens?

How many 7s in 250? How many pieces of candy remain? What do you think he should do with the candy that remains? What can you do with the number that remains when you write the answer?

11. 384 students played basketball on Saturday. The manager wanted 8 on each team. How many teams will play? Did everyone get on a team?

12. 175 m of towelling was bought for a sewing class. Each student is to make a beach towel that takes 2 m . How many students can make a beach towel? Is there any towelling left over?

A Try to finish this problem.
How many 8s in 597?

```
 597
-320      40 eights.
 277        Any more eights?
   ?
```

B Could you have subtracted more than 40 eights in the first step? What is the answer?

Now do these problems.

1. How many 5s in 445?
2. How many 9s in 666?
3. How many 3s in 132?
4. How many 4s in 196?
5. How many 2s in 86?
6. How many 7s in 99?

The fewer subtraction steps you use, the faster you can do the problems. Look at the two methods used for this problem.

$717 \div 8 = \blacksquare$ **THINK** How many 8s in 717?

METHOD 1

```
 717
-160   20 eights.
 557     Any more eights?
-240   30 eights.
 317     Any more eights?
-240   30 eights.
  77     Any more eights?
- 64    8 eights.
  13     Any more eights?
-  8    1 eight.
   5     Any more eights?
         No. Only 5 remains.
```

METHOD 2

```
 717
-400   50 eights.
 317     Any more eights?
-240   30 eights.
  77     Any more eights?
- 72    9 eights.
   5     Any more eights?
         No. Only 5 remains.
```

Is the answer the same for both methods? Could this problem be done with only *two* subtraction steps? **TRY IT**

Remember—there are no rules about how many subtraction steps you should use. But you will want to try to use as little time and paper as possible. There are things a lot more fun to do than to sit around and subtract numbers. Some people are lucky and can guess just about what the answer should be.

1. How many 7s in 513? Bill guessed 20.
Sue guessed 40.
Jay guessed 50.
Who had the best guess? Were any of the guesses wrong?

Guessing an answer does not depend on luck. If you take time to think, your guess can be based on a reason. Then you don't guess at all. You estimate the answer.

2. How many 4s in 251? Are there 10? 20? 30? 40? 50? 60? To make an estimate you would think: What number times 4 is close to 251? You'd pick 60, because 60×4 is 240. That's closer to 251 than 50×4, or 200.

3. How many 9s in 190? **a** 10 nines? **b** 20 nines? **c** 30 nines? Which estimate did you pick? Why?

4. How many 6s in 489? **a** 50 sixes **b** 70 sixes **c** 80 sixes

5. How many 7s in 654? **a** 80 sevens **b** 90 sevens **c** 100 sevens

6. How many 9s in 805? **a** 80 nines **b** 90 nines **c** 100 nines

7. How many 3s in 254? **a** 60 threes **b** 70 threes **c** 80 threes

8. How many 4s in 319? **a** 70 fours **b** 80 fours **c** 90 fours

SHOW HOW GOOD YOU ARE IN ESTIMATING

1. How many 2s in 183?

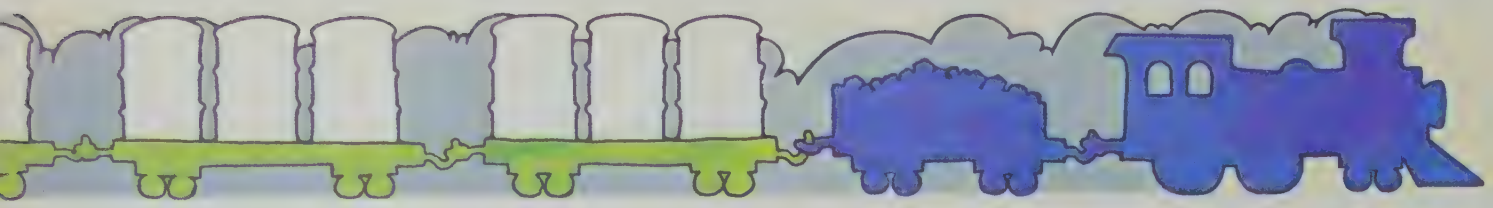
a 70 twos **b** 80 twos **c** 90 twos

2. How many 5s in 499?

a 80 fives **b** 90 fives **c** 100 fives

3. How many 8s in 742?

a 80 eights **b** 90 eights **c** 100 eights



The company is shipping 441 tanks by railroad. They plan to put 3 tanks on each railroad flatcar. How many flatcars needed?

	441	
Step 1	−150	50 threes.
	291	Any more threes?
Step 2	−150	50 threes.
	141	Any more threes?
Step 3	−120	40 threes.
	21	Any more threes?
Step 4	− 21	7 threes.
	0	Any more threes?

How many 3s in 441? Notice that 50×3 was subtracted in steps 1 and 2. Can those steps be put together?

441	
−300	100 threes.
141	Any more threes?
−120	40 threes.
21	Any more threes?
− 21	7 threes.
0	Any more threes? No!

How many 3s in 441?
Subtracting groups of hundreds works well too, doesn't it?

You really need estimating skills to divide.

HOW MANY
4s in 52?

For example:

$10 \times 4 = 40$
$20 \times 4 = 80$

Estimated answer:
There are between 10 and 20 fours in 52.

Here's another problem that is started for you.
The problem looks like this. $76 \div 2$

THINK
How many **2s in 76?**

$20 \times 2 = 40$	Too few.
$30 \times 2 = 60$	Close.
$40 \times 2 = ?$	Too many?

Estimated answer:
There are between ? and ? twos in 76.

YOUR TURN
Estimate answers only.

1. How many 2s in 150?
2. How many 4s in 150?
3. How many 3s in 100?
4. How many 6s in 100?
5. How many 5s in 200?
6. How many 9s in 200?
7. How many 7s in 300?
8. How many 8s in 400?
9. How many 9s in 540?
10. How many 7s in 490?

ESTIMATES
are used every day. Here's one example.

11. I have to wrap 5 presents. I need about 50 cm of ribbon for each one. Will one package of ribbon marked "3 m" be enough? Or should I buy two?

A can of Berpzi cola costs 25¢ in a vending machine. A man came to collect the money in the machine. He counted the quarters. There were 132. Estimate how many dollars that is.

There are 4 quarters in a dollar. So we need to find the number of 4s in 132.

First estimate. $10 \times 4 = 40$ Too few.
$30 \times 4 = 120$ Too few.
$40 \times 4 = 160$ Too many.

The answer is between 30 and 40.
But what is the answer?

Compute.

$$\begin{array}{rl} 132 & \\ -120 & 30 \times 4 = 120 \\ \hline 12 & \text{Any more 4s?} \\ -\ 12 & 3 \times 4 = 12 \\ \hline 0 & \text{Any more 4s?} \end{array}$$

A How many 4s in 132?

NOW TRY THESE PROBLEMS

1. Matt got 153 points on a test. If each problem was worth 3 points, how many problems did he get right?

2. Sara got 180 points on the test. She got all of them right. Remember—each problem was worth 3 points. How many problems were there in the test?

3. Jay got 174 points. How many problems did he get right?

4. Look out for this one! Debbie missed 5 problems. What was her score?

If you see a problem like 235×52,
you write it in another form to compute.
The same thing is true in division.
When you see $79 \div 4$,
you will write it as $4\overline{)79}$ before you compute.

Rewrite these division problems so that they can be computed.

BUT DO NOT COMPUTE.

1. $85 \div 3 = \underline{?}$
2. $94 \div 3 = \underline{?}$
3. $745 \div 9 = \underline{?}$
4. $395 \div 5 = \underline{?}$
5. $845 \div 8 = \underline{?}$
6. How many 4s in 594?

Now start on this computation. $83 \div 5 = \underline{?}$

Think **How many 5s in 83?**
But you write $5\overline{)83}$

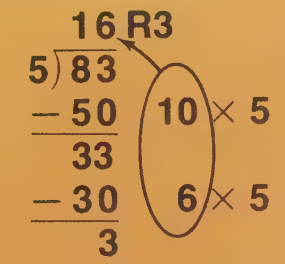
Now estimate. $10 \times 5 = 50$
$20 \times 5 = 100$
The answer is between 10 and 20.

Now compute the answer.

$5\overline{)83}$

-50 10×5
33 Any more 5s?
-30 6×5
3 Any more 5s? No. Only 3 remains.

The answer is $\underline{?}$ with a remainder of $\underline{?}$.
You need a place to write the answer.
Put it above the division symbol.
Write R to signal the remainder.
Put the remainder after the letter R.



Practise dividing after you look at this example.

$52 \div 4$ **THINK** How many 4s in 52? Write: $4\overline{)52}$

Estimate. $10 \times 4 = 40$
$20 \times 4 = 80$

The answer is between 10 and 20.

Use your estimate as you start to compute.

$$\begin{array}{r} 3 \\ 10 \\ 4\overline{)52} \\ -40 \\ \hline 12 \\ -12 \\ \hline 0 \end{array}$$

(10×4) Write 10.
THINK Any more 4s?
(3×4) Write 3.
THINK Any more 4s?

Then complete your answer.

$$\begin{array}{r} ? \\ 3 \\ 10 \\ 4\overline{)52} \\ -40 \\ \hline 12 \\ -12 \\ \hline 0 \end{array}$$

Now practise

1. $7\overline{)84}$ **2.** $5\overline{)130}$ **3.** $9\overline{)118}$ **4.** $3\overline{)111}$ **5.** $6\overline{)165}$ **6.** $7\overline{)135}$

7. $4\overline{)264}$ **8.** $6\overline{)382}$ **9.** $8\overline{)184}$ **10.** $3\overline{)169}$ **11.** $5\overline{)265}$ **12.** $9\overline{)828}$

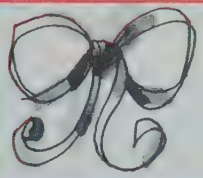
13. Nick found a bargain: 100 foreign stamps for only 25¢. He decided to make 4 packages out of them and sell the packages for 10¢ each. How many stamps would there be in each package?

Some stores have sales that are not really sales at all.
Find the items that are really on sale and that would save you money.

Bunsen's Fire Sale

PLASTIC BATS
3 for **58¢**
regularly 19¢ each

RUBBER BALLS
2 for **88¢**
regularly 43¢ each



HAIR RIBBONS
5 for **70¢**
regularly 12¢ each

GLUE
4 for **99¢**
regularly 23¢ each

MODEL CARS
2 for **94¢**
regularly 48¢ each

JUMP ROPES
2 for **98¢**
regularly 3 for $1.50

GIANT CANDY BARS
5 for **85¢**
regularly 20¢ each

WRITING PAPER
4 boxes for **84¢**
regularly 25¢ each

CAN YOU ESTIMATE LARGER NUMBERS ? FIND OUT

1. About how many 3s in 510?

$100 \times 3 = 300$ Too few.
$200 \times 3 = 600$ Too many.

How many 3s? There are between ? and ? in 510.

2. About how many 2s in 845?

$100 \times 2 = 200$ Way too few.
$300 \times 2 = 600$ Still too few.
$400 \times 2 = 800$ That's better.
$500 \times 2 = 1000$ Too many.

There are between ? and ? 2s in 845.

3. About how many 4s in 964?

$100 \times 4 = 400$ Too few.
$200 \times 4 = 800$ That's better.
$300 \times 4 = 1200$ Too many.

There are between ? and ? 4s in 964.

PROGRESS CHECK

Estimate only.

1. About how many 4s in 96?
2. About how many 3s in 41?
3. About how many 5s in 67?
4. About how many 6s in 83?
5. About how many 8s in 96?
6. About how many 6s in 890?
7. About how many 3s in 775?
8. About how many 5s in 744?
9. About how many 2s in 695?
10. About how many 4s in 998?

1. How many 3s in 710? Write $3\overline{)710}$.

Estimate.
$10 \times 3 = 30$ Whoops! Start again.
$100 \times 3 = 300$ There are lots more than 100.
$200 \times 3 = 600$ That's closer.
$300 \times 3 = 900$ Too many.

Use your estimate to compute.

```
  200
3)710
-600      (200 × 3) Write 200.
 110        Any more 3s?
```

Estimate again.
$20 \times 3 = 60$
$30 \times 3 = 90$
$40 \times 3 = 120$

Use your best estimate to continue.

```
    6
   30
  200
3)710
-600
 110
-  90      (30 × 3) Write 30.
  20          Any more 3s?
 -18       (6 × 3) Write 6.
   2           Any more 3s?
```

What is the complete answer? Where do you write it?

2. Copy this.
Finish the computation.
Write the answer.

Estimate.
$100 \times 2 = 200$
$200 \times 2 = 400$
$300 \times 2 = 600$

Estimate again.
$40 \times 2 = 80$
$50 \times 2 = 100$
$60 \times 2 = 120$

```
   60
  200
2)522
- 400
  122
-   ?
    2
-   ?
    0
```

3. You try one.
How many 4s in 920? Write $4\overline{)920}$ and then compute.

Mark's Record Shop has a sale on 564 phonograph records. A customer must buy 4 records to receive a discount during the sale. How many customers can buy records on sale?

The problem is to find how many 4s in 564. Estimate and then go to work.

How many hundreds times four?

$100 \times 4 = 400$

$200 \times 4 = 800$

How many tens times four?

$20 \times 4 = 80$

$30 \times 4 = 120$

$40 \times 4 = 160$

$50 \times 4 = 200$

Finish up and write the answer on top.

141 people could get a discount buying records.

$$
\begin{array}{r}
? \\
1 \\
40 \\
100 \\
4\overline{)564} \\
-400 \\
\hline
164 \\
-160 \\
\hline
4 \\
-\ 4 \\
\hline
0
\end{array}
$$

You try these problems, following the steps that are shown.

a Write the problem.

b Any hundreds? Estimate. Subtract your best estimate.

c Any tens? Estimate. Subtract your best estimate.

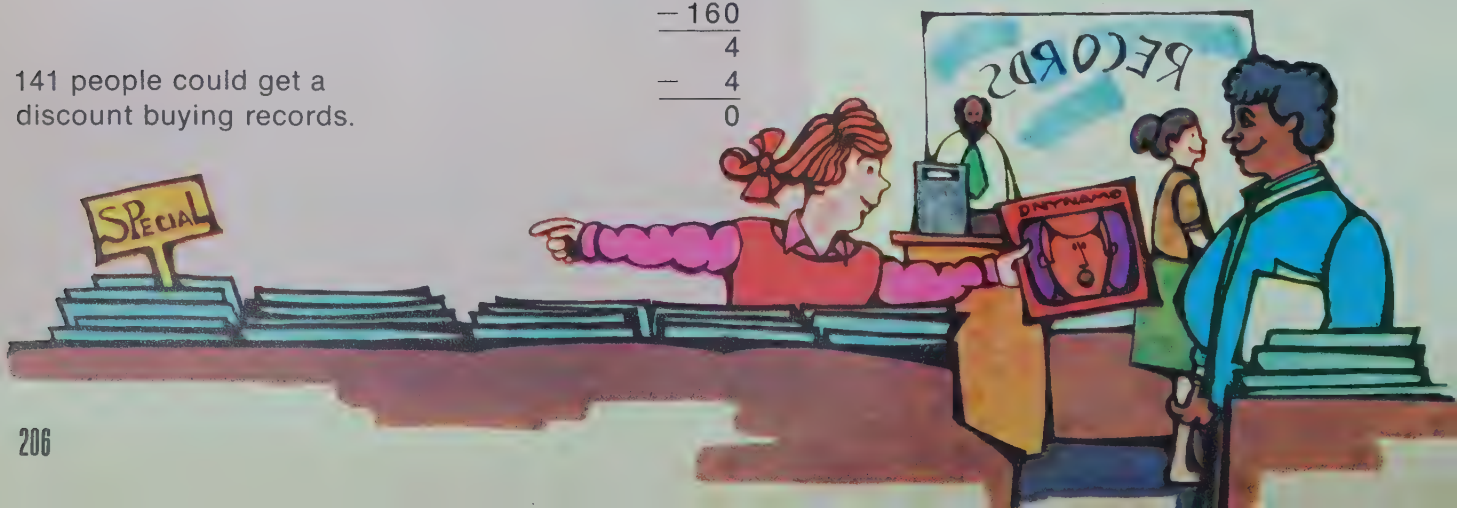
d Continue estimating and subtracting as long as you have to.

e Write the answer on top.

1. $742 \div 3$ **2.** $865 \div 5$

3. $549 \div 3$ **4.** $268 \div 2$

5. $672 \div 6$ **6.** $444 \div 4$



Did you have trouble?

Then work through this one.

$950 \div 2$ This has to be written $2\overline{)950}$

Estimate. $100 \times 2 = 200$ There are lots more than 100 2s.
$300 \times 2 = 600$ Still too few.
$400 \times 2 = 800$ That's better.
$500 \times 2 = 1000$ Too many.

Use your estimate to compute.

Estimate again. $50 \times 2 = 100$
$60 \times 2 = 120$
Use this one. $70 \times 2 = 140$
$80 \times 2 = 160$

$$
\begin{array}{r}
5 \\
70 \\
400 \\
2\overline{)950} \\
-800 \\
\hline
150 \\
-140 \\
\hline
10 \\
-\ 10 \\
\hline
0
\end{array}
$$

What's the answer? How do you write it?
Where does it go?

Try these

1. Each person who applies for a job at Smith Canning Company must fill out 3 forms. One month there were 870 forms done. How many people applied for a job?

The problem: How many 3s in 870? Write $3\overline{)870}$.
Any hundreds? Estimate. Subtract.
Any tens? Estimate. Subtract.
Continue estimating and subtracting.
Write the answer on top.

2. $5\overline{)605}$ **3.** $4\overline{)648}$ **4.** $6\overline{)786}$ **5.** $8\overline{)840}$ **6.** $7\overline{)637}$ **7.** $5\overline{)540}$

DIVISION

In division problems the answer has a special name. It is called a *quotient*. The number that remains after the last subtraction is called the *remainder*. Here is an example.

quotient → 12 R1 ← remainder

```
   12
  8)97
 -80
  17
 -16
   1
```

Do these problems. Estimate the quotient and then compute. Problem 1 is done as an example.

1. $5\overline{)294}$ Estimate. $20 \times 5 = 100$, $30 \times 5 = 150$, $40 \times 5 = 200$, $50 \times 5 = 250$, $60 \times 5 = 300$

The quotient is between 50 and 60.

quotient → 58 R 4 ← remainder

```
   58
  5)294
 -250
   44
 -  40
    4
```

2. $9\overline{)108}$ **3.** $4\overline{)167}$ **4.** $2\overline{)125}$ **5.** $5\overline{)85}$ **6.** $7\overline{)213}$

7. $3\overline{)147}$ **8.** $5\overline{)745}$ **9.** $4\overline{)927}$ **10.** $6\overline{)978}$ **11.** $8\overline{)365}$

12. $9\overline{)927}$ **13.** $3\overline{)955}$ **14.** $6\overline{)546}$ **15.** $4\overline{)975}$ **16.** $3\overline{)732}$

MORE DIVISION

The example given in problem 1 is just about finished.

1.
```
   ???R?
2)775
 -600
  175
 -160
   15
  -14
    1
```

Estimate. $300 \times 2 = 600$
$400 \times 2 = 800$

Estimate. $80 \times 2 = 160$
$90 \times 2 = 180$

2. $3\overline{)645}$ **3.** $4\overline{)585}$ **4.** $7\overline{)923}$ **5.** $5\overline{)674}$ **6.** $2\overline{)875}$ **7.** $3\overline{)847}$

Use division to solve this problem.

8. Detective Sam Shovel has 6 junior detectives working with him. These 7 sleuths divide all the jobs they get equally among themselves. Here is a record of the number of cases they worked on every month for 3 months.

Month	Number of cases
Jan.	49
Feb.	91
Mar.	105

a How many cases did each detective work on in January?

b How many in February? **c** How many in March?

1. Madame Coruscant came to see Detective Sam Shovel with a mystery. She has 96 priceless jewels that she wants to divide equally among her relatives. But strangers keep showing up, claiming to be long-lost cousins or relatives.

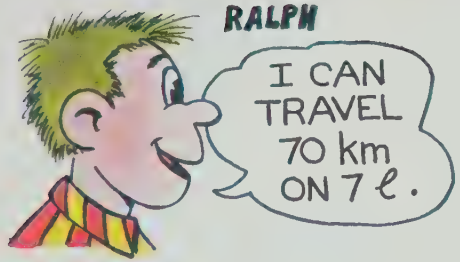
   On Monday she had 2 "relatives."
   By Tuesday she had 4 "relatives."
   By Wednesday she had 6 "relatives."
   By Thursday she had 8 "relatives."
   By Friday she had 9 "relatives."

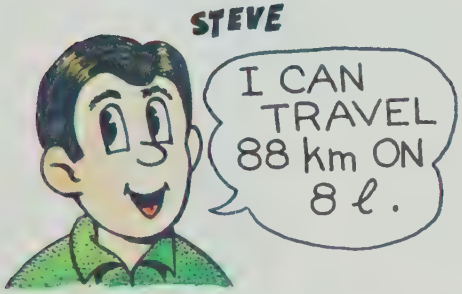
   If she divided up her jewels, how many jewels would each "relative" get on Monday? on Tuesday? on Wednesday? on Thursday? on Friday?

2. Sam Shovel dug right into the case and unearthed the truth. Only 3 of the strangers were really relatives. How many jewels will each real relative get?

Divide.

(1.) $4\overline{)927}$	(2.) $7\overline{)837}$	(3.) $6\overline{)802}$	(4.) $9\overline{)315}$	(5.) $2\overline{)836}$	(6.) $5\overline{)394}$
(7.) $3\overline{)593}$	(8.) $8\overline{)311}$	(9.) $7\overline{)298}$	(10.) $3\overline{)754}$	(11.) $4\overline{)953}$	(12.) $2\overline{)936}$





1. "Kilometres per litre" means how many kilometres a car or other vehicle can travel on one litre of fuel. Ralph, Steve, and Paul were arguing about how many kilometres per litre each of their cars got.

   a How many kilometres per litre does Ralph's car get? Steve's car? Paul's car?

   b Whose car gets the most kilometres for one litre?

2. Sometimes the kilometres per litre a car gets depends on how fast the car is going. Steve tested his car. He got the following results. Compute the number of kilometres per litre for each speed.

   a Under 60 km/h
   "I can get 12 km/ℓ ."
   How many litres needed to go 60 km?

   b 60-80 km/h
   "I can get 11 km/ℓ ."
   How many litres needed to go 88 km?

   c Above 80 km/h
   "I can get 9 km/ℓ ."
   How many litres needed to go 63 km?

Here's an easy problem.

$3\overline{)48}$

You will still estimate. $10 \times 3 = 30$

$20 \times 3 = 60$

The quotient is between 10 and 20.
Are you sure this quotient is *correct*?

$$\begin{array}{r} 16\text{ R0} \\ 6 \\ \hline 10 \\ 3\overline{)48} \\ -30 \\ \hline 18 \\ -18 \\ \hline 0 \end{array}$$

You can use multiplication to check your answer and make sure it is right.
If $48 \div 3 = 16$, then 16×3 should equal 48.
Does it?

$$\begin{array}{r} 16 \\ \times\ 3 \\ \hline 48 \end{array}$$ It checks!

CHECK THESE. IF AN ANSWER IS WRONG, MAKE IT RIGHT.

1

$$\begin{array}{r} 24\text{ R0} \\ 4 \\ \hline 20 \\ 5\overline{)120} \\ -100 \\ \hline 20 \\ -20 \\ \hline 0 \end{array}$$

2

$$\begin{array}{r} 97\text{ R0} \\ 7 \\ \hline 90 \\ 5\overline{)485} \\ -450 \\ \hline 35 \\ -35 \\ \hline 0 \end{array}$$

3

$$\begin{array}{r} 143\text{ R0} \\ 3 \\ \hline 40 \\ 100 \\ 3\overline{)429} \\ -300 \\ \hline 129 \\ -120 \\ \hline 9 \\ -9 \\ \hline 0 \end{array}$$

4

$$\begin{array}{r} 165\text{ R0} \\ 5 \\ \hline 60 \\ 100 \\ 6\overline{)993} \\ -600 \\ \hline 395 \\ -365 \\ \hline 30 \\ -30 \\ \hline 0 \end{array}$$

Practise dividing and checking. Be sure to estimate your quotient before you compute. Problem 1 is done as an example.

1 $3\overline{)298}$ Estimate. $90 \times 3 = 270$
$100 \times 3 = 300$

The quotient is between 90 and 100.

$$\begin{array}{r} 99\ \text{R1} \\ 3\overline{)298} \\ -270 \\ \hline 28 \\ -27 \\ \hline 1 \end{array}$$

Good grief! The check won't work!

If $298 \div 3 = 99$ R1,
then $(99 \times 3) + 1 = 298$.

Multiply 99×3. $\begin{array}{r} 99 \\ \times\ 3 \\ \hline 297 \end{array}$

Then add $297 + 1$. $\begin{array}{r} +\ \ 1 \\ \hline 298 \end{array}$

It does check!

NOW TRY THESE.

2 $3\overline{)131}$	3 $9\overline{)95}$	4 $7\overline{)140}$
5 $8\overline{)245}$	6 $7\overline{)119}$	7 $4\overline{)45}$
8 $3\overline{)62}$	9 $4\overline{)905}$	10 $3\overline{)994}$
11 $6\overline{)500}$	12 $5\overline{)579}$	13 $8\overline{)579}$
14 $5\overline{)158}$	15 $6\overline{)472}$	16 $4\overline{)825}$

Can you divide by a 2-digit number?

$12\overline{)331}$ Estimate. $20 \times 12 = 240$
$30 \times 12 = 360$

The quotient is between 20 and 30.

Cookie Baker made 331 chocolate chip cookies. How many dozen is that?

$$\begin{array}{r} 27\text{ R}7 \\ 12\overline{)331} \\ -240 \\ \hline 91 \\ -84 \\ \hline 7 \end{array}$$

Try this one. Candy Kane received a huge box of chocolates from her uncle in Europe. There were 380 chocolates in 10 layers. How many chocolates were there in each layer?

$10\overline{)380}$ Estimate. $30 \times 10 = 300$
$40 \times 10 = 400$
The quotient is between 30 and 40.

Maybe you already know the quotient. If not, you can compute it.

$$\begin{array}{r} 38\text{ R}0 \\ 10\overline{)380} \\ -300 \\ \hline 80 \\ -80 \\ \hline 0 \end{array}$$

Check. $\begin{array}{r} 38 \\ \times 10 \\ \hline 380 \end{array}$ It checks. There are 38 chocolates in each layer.

You try this one. Estimate, divide, and check. Tina Bopper is giving flowers to all her friends. She has 131 flowers. If she gives each friend a dozen flowers, to how many friends will she give them?

For Experts Only

The first problem is done as an example.
Study it. Then do the others.

1. $5\overline{)7419}$

Estimate. $1000 \times 5 = 5000$
$2000 \times 5 = 10\,000$

The quotient is between 1000 and 2000.

Check:
Multiply 1483×5.
Then add 4.
Does the answer check?

$$
\begin{array}{r}
1483\ \text{R4} \\
5\overline{)7419} \\
-5000 \\
\hline
2419 \\
-2000 \\
\hline
419 \\
-400 \\
\hline
19 \\
-15 \\
\hline
4
\end{array}
$$

2. $4\overline{)372}$ **3.** $7\overline{)608}$ **4.** $3\overline{)1671}$ **5.** $2\overline{)3620}$ **6.** $5\overline{)4461}$

7. $4\overline{)924}$ **8.** $6\overline{)8333}$ **9.** $8\overline{)1875}$ **10.** $5\overline{)9023}$ **11.** $8\overline{)5419}$

12. $7\overline{)999}$ **13.** $6\overline{)8746}$ **14.** $4\overline{)7987}$ ***15.** $9\overline{)11725}$ ***16.** $3\overline{)10651}$

***17.** $20\overline{)532}$ ***18.** $11\overline{)683}$ ***19.** $14\overline{)589}$ ***20.** $15\overline{)860}$ ***21.** $12\overline{)427}$

CHECKOUT

1. Estimate. Do not compute.

a How many 5s in 50? in 250? in 500? in 491?

b How many 4s in 68? in 90? in 120? in 400?

c How many 7s in 35? in 350? in 40? in 400?

d How many 9s in 80? in 800? in 640? in 4500?

2. Which is the best buy?

a 3 for 33¢ or 10¢ each

b 5 for 75¢ or 17¢ each

c 4 for 48¢ or 5 for 50¢

d 2 for 58¢ or 3 for 94¢

3. Divide.

a $9\overline{)189}$ **b** $8\overline{)376}$ **c** $7\overline{)717}$ **d** $5\overline{)184}$

4. Are these problems correct? If any are wrong, correct them.

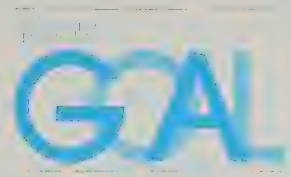
a
$$\begin{array}{r} 61\text{ R0} \\ 1 \\ 60 \\ 6\overline{)366} \\ -360 \\ \hline 6 \\ -6 \\ \hline 0 \end{array}$$

b
$$\begin{array}{r} 44\text{ R0} \\ 4 \\ 40 \\ 4\overline{)179} \\ -160 \\ \hline 16 \\ -16 \\ \hline 0 \end{array}$$

c
$$\begin{array}{r} 151\text{ R0} \\ 5 \\ 10 \\ 100 \\ 5\overline{)575} \\ -500 \\ \hline 75 \\ -50 \\ \hline 25 \\ -25 \\ \hline 0 \end{array}$$

10 MATH SENTENCES

Sentences help people communicate ideas—all kinds of ideas!



is to learn about math sentences so that you can communicate math ideas.

In your language book you find word sentences. In your math book you'll find sentences written with symbols. These are called math sentences.

All math sentences can be translated into word sentences. For example, $2 + 3 = 5$ could be written as the word sentence "Two plus three equals five."

Some word sentences can be translated into math sentences. For example, "Some number times two equals four" translates into a math sentence. $\blacksquare \times 2 = 4$

1. Which of the following are sentences?

a $5 + 6 \neq 20 \div 10$

b With a shout.

c $7 \div 2 = ?$

d Nancy wants to be a doctor.

e $10 + 25$

f $8 \times 3 < 25$

2. Sentences tell a complete idea, and they may be true or false. Which of these sentences are false?

a $20 = 5 \times 4$

b I am reading about math sentences.

c $5 + 6 > 20 \div 10$

d $13 \div 7 \neq 2$

e Bill can run 1 km in 1 min .

f $40 < 39$

There are a lot of different kinds of math sentences.

A
$8 - 5 = 3$
$9 + 5 = 14$ — All of these are sentences.
$10 > 5$ — How are they alike?
$9 < 10$ — How are they different?
$\blacksquare = 10$
$2 \times 4 = 8$
$2 \times 4 = 9$ ←— What kind of sentence is this one?

Look at this list.

B
$8 + 5$
$9 - 3$ — None of these are sentences.
83 — Can you figure out why?
$2 =$ — What is the difference between
$\blacksquare \times 5$ — this list and the first list?
> 4
$3 + \times 4$ ←— Does this one make any sense at all?

Math sentences can have—
one or more numbers involved;
one or more than one operation symbol, or none;
one or more than one placeholder, or none;
correct or incorrect answers.

But a math sentence *must* have a relation symbol.

1

Write math sentences.

a Write one with the math symbol for "equals."

b Write another with the math symbol for "is greater than."

c This time write one with the symbol for "is less than."

d Write a sentence with the symbol for "does not equal."

2

There are many more relation symbols than $=$, $\neq$, $>$, and $<$, but these are the ones you will be needing now. $=$ means the symbols on the left name the same number as the symbols on the right.

$\neq$, $>$, $<$, are inequality symbols.

What does *inequality* mean?

3

Which of these situations would signal an inequality?

a Bill had more than Tom.

b She had as many as he did.

c One metre is not the same distance as one kilometre.

d He didn't work as long a time as his brother.

4

All the following situations show inequalities. Choose one or more math sentences at the bottom of the page that best fit the situation.

a Sam's plant was 35 cm tall.
Maria's was 40 cm .

b In one day Tim collected 150 bottles. Sam collected 225.

c Sarah did 10 problems in one minute.
Jane did only 4 in one minute.

d The River Thames is 336 km long.
The Ganges River is 2400 km long.

1	$225 > 150$	2	$10 < 4$	3	$336 < 2400$
4	$150 > 225$	5	$10 > 4$	6	$40 \neq 35$
7	$2400 \neq 336$	8	$2400 > 336$		

PROGRESS CHECK

1. Choose one word, number, or symbol from each column. Try to write ten sentences.

Open	up	≠	92	day.
Today	×	reserved	overcoat	20
<	little	26	>	now.
The	a	=	first	stay.
4	÷	3	7	7
9	the	5	to	work.
Button	are	the	n	strawberries.
30	56	men	door	5
We	>	your	eat	later.
15	is	people	=	31
21	+	is	involved	with.
?	≠	here	+	12

2. Do all the combinations you wrote tell a complete idea? If they don't, you don't have a sentence.

3. Are all the sentences true? They don't have to be true to be a sentence.

4. Does each of your math sentences have a relation symbol? If it doesn't have =, ≠, >, or <, you don't have a math sentence.

What about this English sentence?
Is it *true* or *false*?

He is taller than Jason.

We don't know whether it's *true* or *false* until we know who "he" is and who "Jason" is, and how tall each of them is. This sentence is *open*, because we don't have all the information.

How about this number sentence—true or false?

$3 + \square = 5$

It could be true. It depends on what's in the box. Is it false? It could be, depending on what's in the box. We don't know whether $3 + \square = 5$ is true or false. $3 + \square = 5$ is an *open sentence*. An *open sentence* is neither true nor false.

Here are some words: *train, stumps, mountains, road, deer, trees, river, fence, snow*. Select one of the words to make each English sentence true.

1. There is a winding ? .
2. The sun shines on the ? .
3. The ? are tall.
4. The ? are near the fence.

Here are some numbers: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12.
Select one of the numbers to make each math sentence true.

5. $4 > \square$ **6.** $3 + 4 \neq \square$ **7.** $10 < \square$ **8.** $8 < \square$ **9.** $\square < 12$ **10.** $0 < \square$

1. Which of the following sentences are true?

a All cats have blue eyes.

b $82 - 24 < 49$ **c** $36 + 3 \neq 58$

d Toronto is a Canadian city.

e There are 100 centimetres in 1 metre.

f $45 \div 9 = 5$ **g** $17 + 21 > 36$

h One metre is almost as long as one kilometre.

i A kilogram is a measure of mass.

2. Use $>$, $<$, or $=$ to make each math sentence true.

a 7643 ? 7463 **b** 16 thousand ? 16 000

c 8×8 ? 64 **d** $72 \div 8$? 7

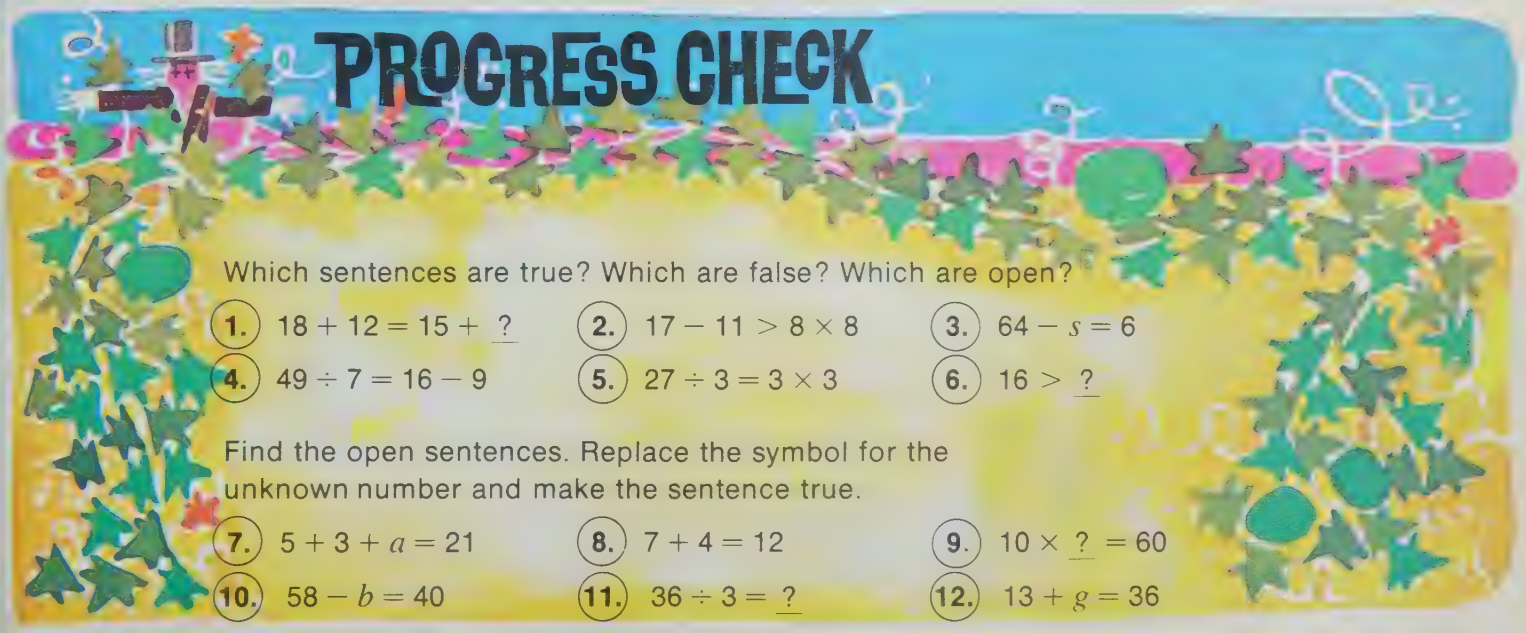
e $18 + 3$? 21 **f** $492 - 183$? 319

3. Which sentences do you know are true?

a $14 + \underline{?} = 20$ **b** $\underline{?} \div 5 = 30$

c $16 > \underline{?}$ **d** $10 \times \underline{?} < 70$

e $4 \times \underline{?} = 0$ **f** $10 \times \underline{?} = 10$



Which sentences are true? Which are false? Which are open?

1. $18 + 12 = 15 + \underline{?}$ **2.** $17 - 11 > 8 \times 8$ **3.** $64 - s = 6$

4. $49 \div 7 = 16 - 9$ **5.** $27 \div 3 = 3 \times 3$ **6.** $16 > \underline{?}$

Find the open sentences. Replace the symbol for the unknown number and make the sentence true.

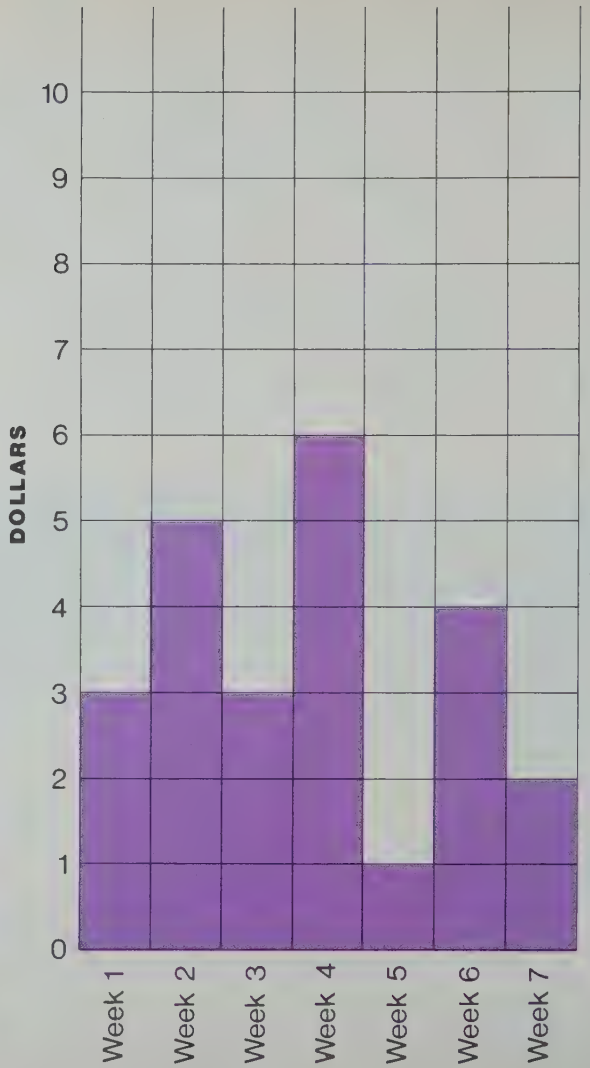
7. $5 + 3 + a = 21$ **8.** $7 + 4 = 12$ **9.** $10 \times \underline{?} = 60$

10. $58 - b = 40$ **11.** $36 \div 3 = \underline{?}$ **12.** $13 + g = 36$

English sentences help us communicate.
Math sentences do too.

Phil's class collected money for a class project. Study the chart that shows how much money the class collected each week.

The graph gives us a good picture of what happened. But what could we tell someone about the project? Pick a math sentence at the bottom of the page that could help answer each question.



1. How much was collected each week? What was the total amount?

2. What is the difference between the greatest amount of money collected in one week and the least amount collected in one week?

3. How much more money was collected the first week than the last week?

4. Their goal was to collect $20. Did they reach their goal?

a $20 > \blacksquare$

b $6 - 1 = \blacksquare$

c $3 + 5 + 3 + 6 + 1 + 4 + 2 = \blacksquare$

d $20 < \blacksquare$

e $3 - 2 = \blacksquare$

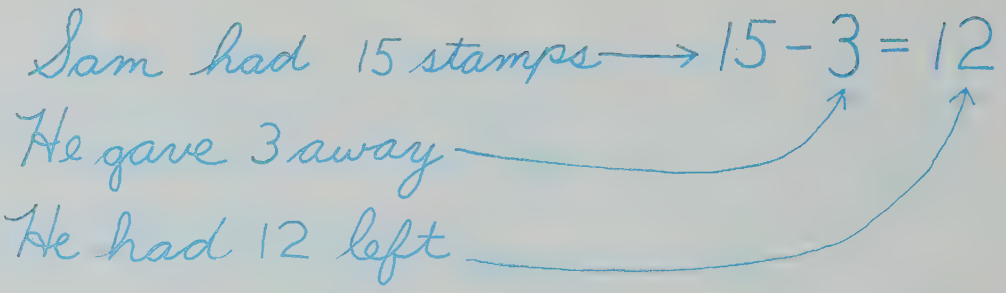
f $6 - 5 = \blacksquare$

Pretend you got an invitation to a party. Lots of your good friends got invitations too. Nobody knew who was giving the party. The invitation told you only how to get to the party. Here is a copy of the invitation.

Come to a party Saturday night at 7:30.
CARNIVAL
GARAGE
EMPTY HOUSE
N
W
E
S
PARK
BOWLING
SKATING RINK
THEATRE
PIZZA
SCHOOL
Just follow the map and directions and you'll know where to go.
Start at the school. Go y blocks east. ---- 27 − y = 25
Go n blocks north. --- n × 5 = 25
Go b blocks east. ---- a + 10 = 14 and 6 − a = b
Go S blocks south. --- 36 ÷ S = 9

What was probably the main happening at the party?
Was there a shorter way to get to the party? What was it?

We can write a math sentence to fit situations.



What English words in the situation gave the subtraction clue?

Four situations and four math sentences are written below. Pick the math sentence that fits the situation.

1. Tom caught 13 fish. Bill caught less. How many fish could Bill have caught?

2. Sara had 13. How many did she have after she gave 2 of them away?

3. Chris collected 13 kg of scrap metal. Doug collected double that amount. How much did Doug collect?

4. Judy had 13 box tops saved for the prize. Dan gave her 2 more. How many box tops did she have then?

a $13 - 2 = \underline{?}$ **b** $13 \times 2 = \underline{?}$

c $13 > \underline{?}$ **d** $13 + 2 = \underline{?}$

Now make each sentence true.

Would you add, subtract, multiply, or divide to compute the answers to the following problems? Write an open math sentence to show what you would do in each case.

1. She had 6. He had twice as many as she did. How many did he have?

2. They had 27. They gave 12 away. How many did they have left?

3. There were 24 in the bag. Three people were to share them. How many did each person get?

4. He ate 2 on Monday, 2 more on Tuesday, none on Wednesday, but 4 on Thursday. How many did he eat?

5. He had made 1 sale. He bragged he doubled his sales. How many sales had he made in all?

6. There should be 12 on each page. She wanted them in 3 rows. How many should be in each row?

7. One of them cost 49¢. They wanted 4 of them. How much did they pay in all?

8. He walked 15 blocks. He turned around and came back. How far did he walk in all?

9. She bought a red one that cost $2.98. She returned a blue one that cost $1.39. How much did she have to pay?

10. There were 10 rows of chairs. There were 24 chairs in each row. How many chairs in all?

PROGRESS CHECK

A math sentence can contain many different symbols. It must contain a relation symbol.

Here is a summary of the types of sentences you have studied. You supply at least three examples of each type.

Type of Sentence	Characteristics	Examples
Equality	Contains the relation symbol $=$.	(1.) You give 3 examples.
Inequality	Contains any one of the relation symbols: $>$, $<$, or $\neq$.	(2.) You give 3 examples.
True sentence	Must be mathematically correct.	(3.) You give 3 examples.
False sentence	Is mathematically incorrect.	(4.) You give 3 examples.
Open sentence	Contains a placeholder for missing numbers. It is neither true nor false.	(5.) You give 3 examples.

YOU

can find an answer to some story situations without writing a math sentence. If you want to make sure you are on the right track, however, you might write a math sentence to show yourself and others that your answer was right.

Here is a set of story problems about a hobby shop. You'll also see the answers that Terry thought were correct. Write a math sentence to check to see if Terry was correct. If he made an error, you give the correct answer.

1. One case in the hobby shop had 6 shelves. Each shelf had 8 different model cars. How many model cars were in the case? 48

2. Dan needed 200 picture mounts. Each package contained 50. How many packages would Dan have to buy? 4

3. Don had $3.00. He wanted to buy a model plane for 98¢, a craft book for $1.25, and a tube of glue that cost 49¢. Did Don have enough money? No

4. How many metres of cord can Lois buy if it costs 9 cents a metre and she has $1.25? 9

5. Len got back 16¢ change. He had given the clerk 75¢ for something priced at 59¢. Was this the correct change? Yes

6. Jan bought 3 packages of seed beads for 89¢ each. How much did the 3 packages cost in all? $2.58

TRUE OR FALSE?

This time it's your turn to find the answers.
Write a math sentence to back up your answer.

1. There are 30 students in Tim's class. 19 students brought their lunch. The rest bought their lunch. Tim is in charge of collecting the lunch money. He said that 12 students bought their lunch.
Is his statement true or false?

2. Yesterday 15 students gave Tim their lunch money. Lunch costs 30¢. Tim said that he collected $4.50.
Was his statement true or false?

3. Monday was Peanut Butter and Jelly Day. Mae gave each student (including herself) 3 peanut butter and jelly sandwiches. She handed out 84 sandwiches in all. She said there are 29 students in the class.
Was her statement true or false?

4. Sidney studied for 20 minutes before the test and 45 minutes after the test. He said he studied for an hour.
Was his statement true or false?

5. Terri was measuring in paces. She made 16 paces and then 26 more paces. Terri thought to herself, "I have already made more than 40 paces."
Was her statement true or false?

Here is a copy of Cindy's homework. She made some mistakes. Can you find them? Use math sentences to check her work.

name Cindy

1. Peter had 24 comic books and Joseph had 47 comic books. Joseph threw away 22 of his comic books because they had bad plots. Who has more comic books now—Joseph or Peter?

Joseph

2. Carla's mass is 30 kg . Together, she and her brother have a mass of 49 kg . What is the mass of Carla's brother?

19 kg

3. Tickets for the raffle cost 50¢ each. Carol has $2.75. How many tickets can she buy?

6 tickets

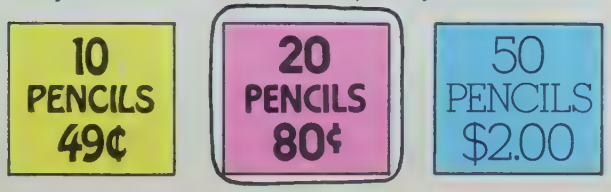
4. Mara has just finished reading a book that is 232 pages long. Because she was in a hurry, she skipped 42 pages. How many pages did she actually read?

185 pages

5. Arnie the porcupine had 148 quills. He gave 32 of them to a curious dog. How many quills does Arnie have left?

126 quills

6. Which box of colored pencils is the best buy? They are all of the same quality.



7. Might there ever be a time when the cheapest is not the best buy?

No

You can't always solve a problem in your head. Sometimes large numbers make a problem difficult.

1. Steve works all summer doing odd jobs. He washes cars, mows lawns, babysits, runs errands, and does other things like that. Last summer he kept a record of how much he earned and how much he spent.

	Earned	Spent	Saved
July	$64.95	$49.50	?
August	98.70	56.30	?

Now answer these questions. If you don't need a math sentence to help you get started, then write one to show how you got your answer.

a How much did Steve save in July? in August?

b How much did he earn in the two months?

c How much did he spend in the two months?

d How much did he save in all?

Could more than one sentence be written for the last question?

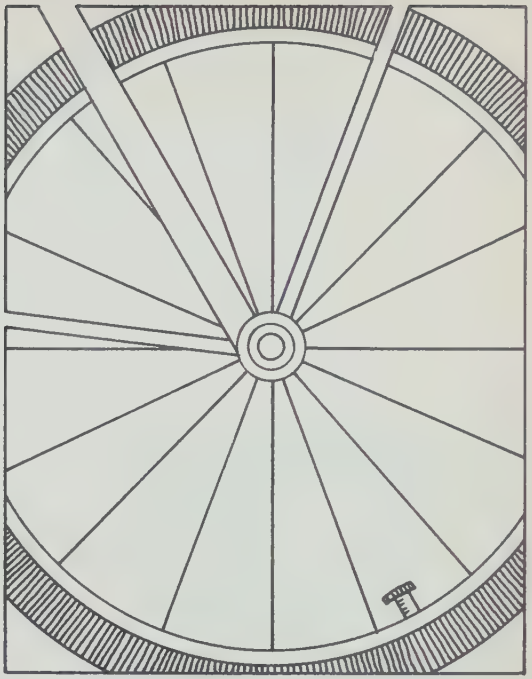
2. Sometimes a math sentence helps you keep track of a lot of numbers needed to find just one answer to a problem. Try this problem.

Only 6 persons got off the bus at the first stop at C Street, 2 persons got off at D Street, 4 persons got off at E Street, and the last 5 persons got off at F Street. How many passengers were on the bus?

Write a true sentence to show your answer.

Math sentences can help you get organized. Work through these questions. Writing a math sentence for each question will help.

Mr. Mason owns the Bike Shop. One week he bought 8 boxes of bicycle spokes for $16.00. Each box contained 10 spokes.



1. How many spokes were there in the 8 boxes?
2. How much did each spoke cost Mr. Mason?
3. Do you think Mr. Mason will sell the spokes for the same amount of money he paid for them? Why?
4. There is usually a difference between the cost of an item and its selling price. Suppose Mr. Mason sells each spoke for 5¢ more than he paid for it.
   - **a** What would be the price of 1 spoke?
   - **b** If he sells all the spokes, how much will he get?
   - **c** How much more is this than he paid for them?

These next questions are for thinking, not computing.

5. What are some of the things Mr. Mason will have to pay for with the money he gets from his sales? Think about all the bills he has to pay to keep his store open. These bills are called expenses.
   - **a** Would the expenses a grocery store pays be the same as those of a bicycle shop?
   - **b** Does a movie theatre have expenses? What might they be?
   - **c** Would a coin-operated laundry have expenses? A bowling alley? A restaurant?

Sam broke some spokes on his bike and the chain too. He went to several repair shops to find out how much it would cost to have someone repair his bike. Sam took the information home to have his dad look it over.

His father found some

mistakes

Can you find them too?

Bill's Bikes	
Parts	
5 spokes 20¢ each	$1.00
Labor	
$2.60 an hour time: 1h	2.60
TOTAL	$4.20

SALLY'S CYCLES	
PARTS	
5 spokes 30¢ each	$1.50
LABOR	
$1.90 an hour 3 hours	$4.70
TOTAL	$6.20

ED'S BIKE SHOP	
Parts	
5 Spokes 25¢ each	$1.50
Labor	
replace Spokes $2.25 an hour labor 2 hours	$4.50
TOTAL	$6.00

If you were Sam, which place would you have do the repairs?

CHECKOUT

1. Tell whether each sentence is true, false, or open.

a $13 > 14 \div 2$ **b** $125 \div 5 = 25$

c $n - 2 > 0$ **d** $63 \div 7 = 9 \times n$

e $175 \div 7 = \underline{?}$ **f** $\frac{1}{4} < \frac{1}{3}$

g $8 + n = 25$ **h** $2005 \times 6 = ?$

i $\frac{1}{4} + \frac{3}{4} = \frac{4}{8}$ **j** $\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$

2. Make each open sentence above a true sentence.

Find an answer to each of the problems. Then write a true math sentence to back up your answer.

3. a She had 15 goldfish. She sold 7. How many goldfish did she have left?

b She sold the goldfish for 25¢ each. How much money did she get when she sold the 7?

4. a 24 chairs in each row. There were 110 rows. How many chairs in all?

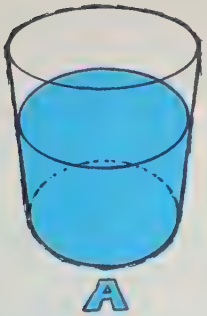
b Only 950 adults came to the meeting. 467 of them were women. How many men were there?

5. a Bill bought 5 pens for 75¢. How much did each pen cost?

***b** He sold each of the pens for 20¢. How much money did he earn?

11 FRACTIONS

You have a good start in learning how to add and subtract fractions. Your goal now is to learn still more about fractions AND addition and subtraction.

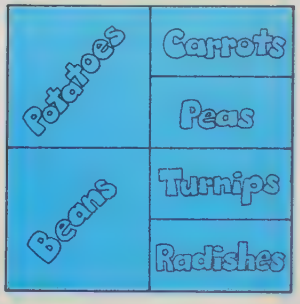


Is glass A half full? Is it half empty?
Is glass B $\frac{1}{4}$ full or $\frac{3}{4}$ empty?

1. If I have a glass that is $\frac{1}{4}$ full of orange juice, and you have a glass that is $\frac{2}{8}$ full of orange juice, do we have the same amount?

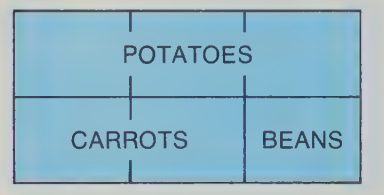
- **a** If Muriel has a glass $\frac{4}{16}$ full, does she have as much as you have?
- **b** Does she have as much as I have?
- **c** Do we all have the same amount?

2. Mr. Smith's vegetables are grown in a square plot. He hopes to get $\frac{3}{4}$ of his vegetables planted today, and the rest tomorrow. Name three different combinations of vegetables that he could plant to get $\frac{3}{4}$ of them in today.

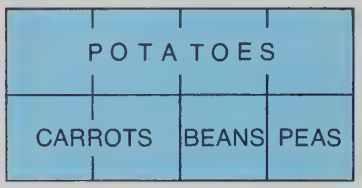


Mr. Fielding and Mrs. Gardner have vegetable plots the same size and shape.

Mr. Fielding plants his plot with potatoes, carrots, and beans, like this:



Mrs. Gardner plants her plot with potatoes, carrots, beans, and peas, like this:



1. Does Mr. Fielding have $\frac{1}{2}$ of his plot in potatoes? Does he have $\frac{3}{6}$ of his plot in potatoes?
2. Does Mrs. Gardner have $\frac{1}{2}$ of her plot in potatoes? $\frac{2}{4}$ of her plot? $\frac{4}{8}$ of her plot?
3. Who has more land in potatoes?
4. Does Mr. Fielding have $\frac{2}{6}$ of his land in carrots? Does he have $\frac{1}{3}$ of it in carrots?
5. Does Mrs. Gardner have $\frac{1}{4}$ of her land in carrots? $\frac{2}{8}$ of her land?
6. Who has more land in carrots?
7. What part of his land does Mr. Fielding have in beans?
8. What part of her land does Mrs. Gardner have in beans?
9. Who has more land in beans?
10. What part of her land does Mrs. Gardner have in peas?

1. You'll need a sheet of notebook paper, scissors, and a pencil.

a Cut three strips from the bottom of your paper. Make each strip about 5 cm wide.

b Fold the first strip into 2 equal parts. Crease the fold.

c Open the strip. How many equal parts? Mark each part $\frac{1}{2}$.

d Fold the next strip into 2 equal parts. Crease the fold. Fold it again into 2 equal parts.

e Open the strip. How many equal parts? Mark each part $\frac{1}{4}$.

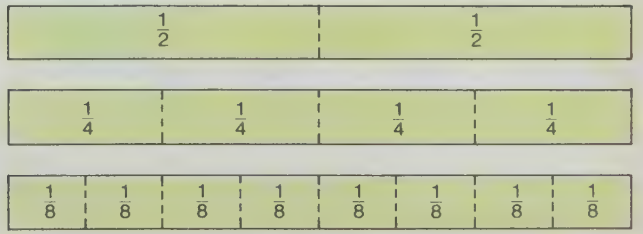
f Fold the third strip into 2 equal parts. Fold it again into 2 equal parts. And once more into 2 equal parts. Crease the fold each time.

g Open the strip. You should have 8 equal parts. Mark each part $\frac{1}{8}$.

2. Compare the three strips. Which is more?

a $\frac{1}{2}$ or $\frac{1}{4}$ of a strip **b** $\frac{1}{4}$ or $\frac{1}{8}$ of a strip **c** $\frac{1}{8}$ or $\frac{1}{2}$ of a strip

Use the number strips if you need help.



3. Which is more?

a $\frac{1}{8}$ or $\frac{1}{4}$ strip **b** $\frac{1}{4}$ or $\frac{1}{2}$ strip

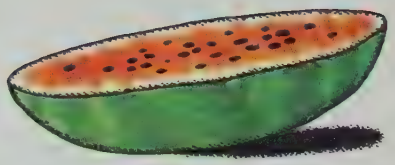
LOOK OUT!

c $\frac{1}{2}$ or $\frac{2}{4}$ **d** $\frac{1}{2}$ or $\frac{4}{8}$

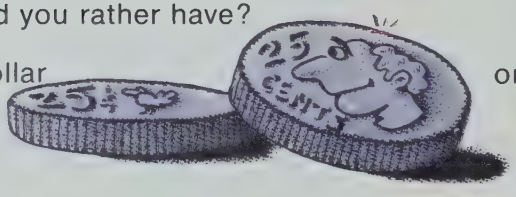
WHEN IS $\frac{1}{2}$ NOT EQUAL TO $\frac{1}{2}$?

Here are some other questions that may help you answer that question.

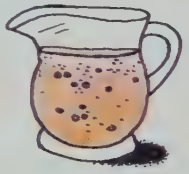
1. Which is larger?

$\frac{1}{2}$ or $\frac{1}{2}$ 

2. Which would you rather have?

$\frac{1}{2}$ of one dollar  or $\frac{1}{2}$ of ten dollars

3. Which is smallest?

$\frac{3}{4}$ or $\frac{3}{4}$ or $\frac{3}{4}$ 

4. Which is longer, half an hour or half a day?

The questions were not meant to fool you. They should remind you that when we use fractions to compare, we must use equal units.

$\frac{1}{2}$ $\frac{1}{2}$
How many $\frac{1}{2}$s? Does $\frac{2}{2} = 1$?
$\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$
How many $\frac{1}{4}$s? Does $\frac{2}{4} = \frac{1}{2}$?
$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$
How many $\frac{1}{8}$s? Does $\frac{4}{8} = \frac{2}{4}$?
$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$
How many $\frac{1}{3}$s? Does $\frac{3}{3} = 1$?
$\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$ $\frac{1}{6}$
How many $\frac{1}{6}$s? Does $\frac{2}{6} = \frac{1}{3}$?

Use the number strips to help you answer these questions.

1. Which fraction is greater?

a $\frac{1}{6}$ or $\frac{1}{8}$ **b** $\frac{1}{3}$ or $\frac{1}{2}$ **c** $\frac{1}{4}$ or $\frac{1}{2}$ **d** $\frac{1}{8}$ or $\frac{1}{2}$

e $\frac{1}{3}$ or $\frac{2}{3}$ **f** $\frac{2}{3}$ or $\frac{1}{3}$ **g** $\frac{5}{8}$ or $\frac{7}{8}$ **h** $\frac{3}{8}$ or $\frac{7}{8}$

2. Which fraction is less?

a $\frac{1}{4}$ or $\frac{1}{3}$ **b** $\frac{2}{3}$ or $\frac{2}{8}$ **c** $\frac{3}{6}$ or $\frac{3}{8}$ **d** $\frac{2}{4}$ or $\frac{2}{6}$

e $\frac{2}{4}$ or $\frac{3}{4}$ **f** $\frac{1}{6}$ or $\frac{2}{6}$ **g** $\frac{4}{8}$ or $\frac{5}{8}$ **h** $\frac{5}{6}$ or $\frac{4}{6}$

3. Complete to make each sentence true.

a $\frac{1}{2} = \frac{?}{4}$ **b** $\frac{2}{3} = \frac{?}{6}$ **c** $\frac{1}{2} = \frac{?}{8}$ **d** $\frac{4}{4} = \frac{?}{8}$

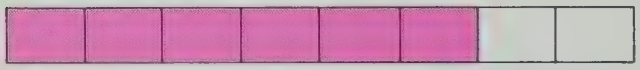
e $\frac{6}{8} = \frac{?}{4}$ **f** $\frac{1}{4} = \frac{?}{8}$ **g** $\frac{1}{3} = \frac{?}{6}$ **h** $\frac{3}{4} = \frac{?}{8}$

i $\frac{2}{8} = \frac{?}{4}$ **j** $\frac{3}{3} = \frac{?}{6}$ **k** $\frac{2}{4} = \frac{?}{8}$ **l** $\frac{4}{6} = \frac{?}{3}$

Some of Robert's friends call him Robert. Others call him Bob. Still others call him Rob. His mother calls him Bobby. Is Robert still the same person even though different people call him different names? Is $\frac{1}{2}$ still the same number even though at different times it might be called $\frac{2}{4}$, $\frac{4}{8}$, or $\frac{8}{16}$?

1.

A

B 

What fraction represents the shaded part of region A? of region B? Do these fractions name the same fractional number?

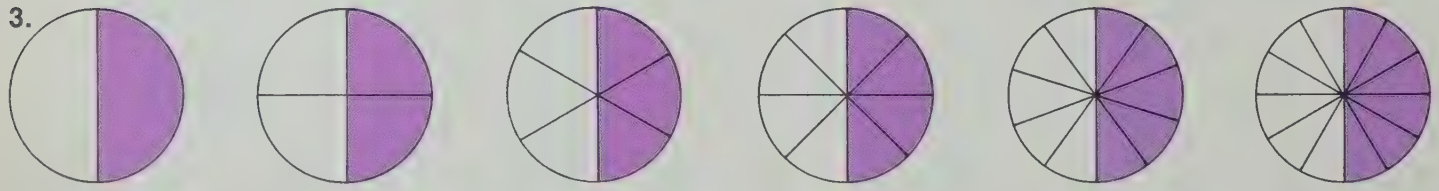
2.

C

D

What fraction represents the shaded part of region C? of region D? Do these fractions name the same fractional number?

3.



A B C D E F

What fraction names the amount shaded in each of these regions? Do these fractions all name the same fractional number?

This type of renaming is often needed.

For example: $\frac{1}{4} + \frac{1}{4} = \frac{1+1}{4} = \frac{2}{4}$

Is there another name for $\frac{2}{4}$? What is it?

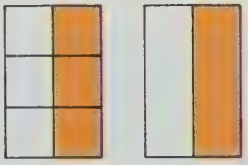
Try these on your own

A

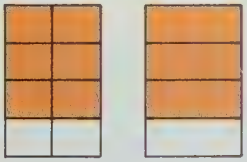
B

C

1. What part of region A is shaded? What part isn't shaded?
2. What part of region B is shaded? What part isn't?
3. What part of region C is shaded? What part isn't?
4. Is the same amount shaded in each region?
   Is the same amount unshaded?
5. Are $\frac{2}{3}$, $\frac{4}{6}$, and $\frac{6}{9}$ all names for the same number?
6. Does $\frac{2}{3} = \frac{4}{6}$? Does $\frac{2}{3} = \frac{6}{9}$? Does $\frac{4}{6} = \frac{6}{9}$? Does $\frac{1}{3} = \frac{2}{6}$? Does $\frac{1}{3} = \frac{6}{9}$?
7. $\frac{2}{6} + \frac{2}{6} = \frac{4}{6}$ Is there another name for $\frac{4}{6}$?
   What is the simpler name?
8. Now look at pairs of regions. You will be finding other names for fractions.



a $\frac{3}{6} = \frac{?}{2}$



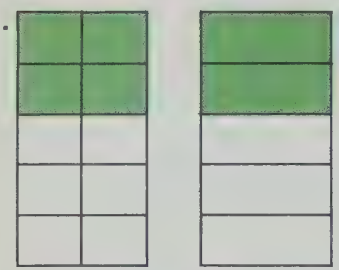
b $\frac{6}{8} = \frac{?}{4}$

Look at the unshaded parts.
$\frac{2}{8} = \frac{?}{4}$

9. $\frac{1}{6} + \frac{2}{6} = \frac{1+2}{6} = \frac{3}{6}$ What is a simpler name for $\frac{3}{6}$?
10. $\frac{3}{8} + \frac{3}{8} = \frac{3+3}{8} = \frac{6}{8}$ What is a simpler name for $\frac{6}{8}$?

Look at more pairs of regions. First look at the shaded parts. Then look at the unshaded parts.

1.

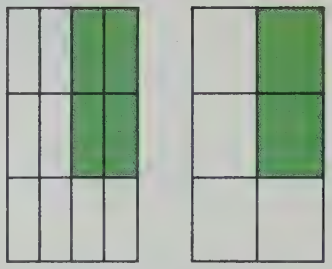


a $\frac{4}{10} = \frac{?}{5}$
shaded parts

and

b $\frac{6}{10} = \frac{?}{5}$
unshaded parts

2.

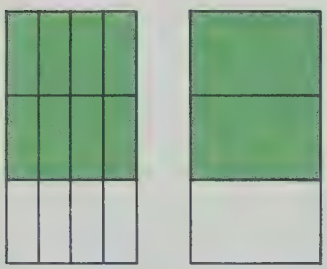


a $\frac{?}{12} = \frac{2}{6}$
shaded parts

and

b $\frac{8}{12} = \frac{?}{6}$
unshaded parts

3.

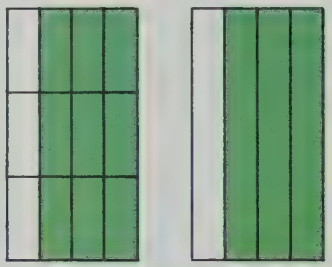


a $\frac{8}{12} = \frac{?}{3}$
shaded parts

and

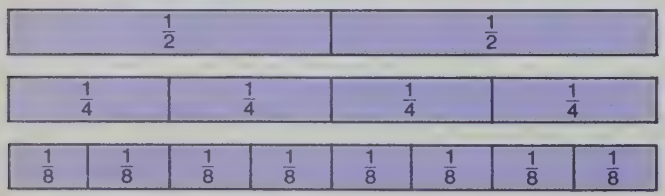
b $\frac{?}{12} = \frac{1}{3}$
unshaded parts

4.

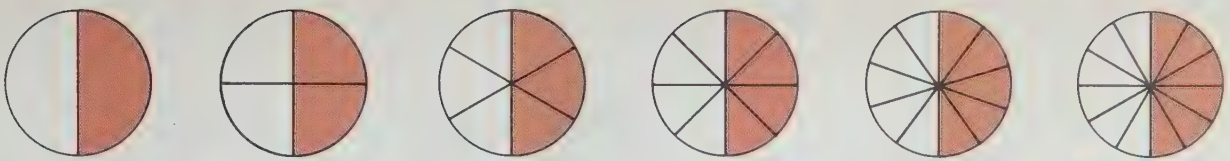


What pairs of equal fractions name the shaded parts? the unshaded parts?

Use these number strips to complete each pair of fractions.



1. $\frac{1}{2} = \frac{?}{4}$
2. $\frac{1}{2} = \frac{?}{8}$
3. $\frac{4}{4} = \frac{?}{8}$
4. $\frac{6}{8} = \frac{?}{4}$
5. $\frac{1}{4} = \frac{?}{8}$
6. $\frac{3}{4} = \frac{?}{8}$
7. $\frac{2}{8} = \frac{?}{4}$
8. $\frac{2}{4} = \frac{?}{8}$



The shaded parts in each of the regions above show the same fraction. Why?

Shaded parts → $\frac{1}{2}$
Parts in all → $\frac{1}{2}$

Double these and what happens?

The number of shaded parts doubled also.
$\frac{1}{2}$ is the same as $\frac{1 \times 2}{2 \times 2}$ or $\frac{2}{4}$.

Make three times as many parts.

$\frac{1 \times 3}{2 \times 3} = \frac{3}{6}$

When you multiply the numerator and denominator by the same number, you can find another name for a fraction.

Are these names for the same fraction? $\frac{1}{3}, \frac{2}{6}, \frac{3}{9}, \frac{4}{12}$

Think! What will result from multiplying the numerator and the denominator by the same number?

Start with the simplest name, $\frac{1}{3}$. $\frac{1 \times 2}{3 \times 2} = \frac{2}{6}$ $\frac{1}{3}$ does equal $\frac{2}{6}$!

$\frac{1 \times 3}{3 \times 3} = \frac{3}{9}$ $\frac{1}{3}$ does equal $\frac{3}{9}$!

$\frac{1 \times 4}{3 \times 4} = \frac{4}{12}$ $\frac{1}{3}$ does equal $\frac{4}{12}$!

Go back to the regions at the top of the page.
What number times $\frac{1}{2}$ has been used to get the fraction $\frac{4}{8}$? $\frac{5}{10}$? $\frac{6}{12}$?

Is $\frac{2}{6}$ the simplest name for a fraction?

Look at the model. Does $\frac{2}{6}$ also name $\frac{1}{3}$?

WHAT'S HAPPENING NOW?

THINK

I can multiply by the same number and get a larger numerator and denominator.

WHY NOT divide by the same number to get a smaller numerator and denominator?

The number you use to divide is called a common factor.

$\frac{2 \div ?}{6 \div ?}$ What is a common factor? Will 2 work? $\frac{2 \div 2}{6 \div 2} = \frac{1}{3}$

2 is a common factor.

AND $\frac{2}{6}$ does equal $\frac{1}{3}$.

LOOK AT ANOTHER

Is $\frac{6}{8}$ the simplest name for a fraction?

Do $\frac{6}{8}$ have a common factor? Try 2 again. $\frac{6 \div 2}{8 \div 2} = \frac{3}{4}$

Is $\frac{3}{4}$ the simplest name? Do $\frac{3}{4}$ have a common factor?

$\frac{3 \div 3}{4 \div 3}$ $\frac{3 \div 2}{4 \div 2}$ No! $\frac{3}{4}$ is the simplest name.

YOUR TURN

Rename each fraction with its simplest name.

1. $\frac{9}{12}$ **Think** $\frac{9 \div ?}{12 \div ?}$ What is a common factor?

2. $\frac{12}{16}$ **Think** What is a common factor?

3. $\frac{2}{6}$ **4.** $\frac{3}{9}$ **5.** $\frac{4}{12}$ **6.** $\frac{2}{12}$

7. $\frac{3}{18}$ **8.** $\frac{4}{24}$ **9.** $\frac{5}{10}$ **10.** $\frac{8}{10}$

Make sure you can always find the simplest name for a fraction if you divide numerator and denominator by a common factor.

EXPLORE! EXPERIMENT! TRY IT!

Try $\frac{3}{6}$. Is there a common factor of the numerator and denominator?

Try 3. Divide. $\frac{3 \div 3}{6 \div 3} = \frac{1}{2}$ It worked again!

Try some more.
Divide numerator and denominator by a common factor.

1. $\frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{?}{?}$ **2.** $\frac{3}{12} = \frac{3 \div 3}{12 \div 3} = \frac{?}{?}$ **3.** $\frac{2}{8} = \frac{2 \div 2}{8 \div 2} = \frac{?}{?}$

TIME OUT TO LOOK AT A CURVE BALL

$\frac{4}{12}$ It's true that 2 is a common factor.

$\frac{4 \div 2}{12 \div 2} = \frac{2}{6}$ But that is not the simplest name.
You can see 2 is another common factor.
Don't be discouraged. Divide again.

$\frac{2}{6} = \frac{2 \div 2}{6 \div 2} = \frac{1}{3}$ That's it!

You could have saved the extra step had you divided by the common factor 4. $\frac{4}{12} = \frac{4 \div 4}{12 \div 4} = \frac{1}{3}$ Same answer.

The common factor 2 works. The greater common factor 4 works faster. Sooner or later you come out with the simplest name.

Try some more. Find the simplest name.

4. $\frac{2}{12}$ **5.** $\frac{3}{12}$ **6.** $\frac{6}{12}$ **7.** $\frac{3}{6}$ **8.** $\frac{4}{6}$

What is the simplest name for $\frac{8}{12}$?

Think Is there a common factor of the numerator and denominator? 2? 3? 4? 6? You can pick 2 as the common factor.
Or you could pick 4.

Here is what happens when you pick 2.

$$\frac{8}{12} = \frac{8 \div 2}{12 \div 2} = \frac{4}{6}$$

You have to divide again.

$$\frac{4}{6} = \frac{4 \div 2}{6 \div 2} = \frac{2}{3}$$

It took two steps, but you could find the simplest name. Now look what happens when you pick 4.

$$\frac{8}{12} = \frac{8 \div 4}{12 \div 4} = \frac{2}{3}$$

It took only one step to find the simplest name.

Put your renaming skill together with your addition skill. Remember how to add fractions?

$\frac{1}{10} + \frac{7}{10} = \frac{1+7}{10} = \frac{8}{10}$ Is $\frac{8}{10}$ the simplest name?

Is there a common factor of the numerator and denominator?

$\frac{8 \div 2}{10 \div 2} = \frac{4}{5}$ This is the simplest name.

You don't have to write down all these steps. Write only what you have to in order to get the right answer. Try these.

ADD

Make sure the sum has its simplest name.

	a	b	c
1.	$\frac{1}{4} + \frac{1}{4}$	$\frac{7}{12} + \frac{1}{12}$	$\frac{1}{6} + \frac{1}{6}$
2.	$\frac{3}{8} + \frac{1}{8}$	$\frac{1}{9} + \frac{2}{9}$	$\frac{5}{12} + \frac{1}{12}$
3.	$\frac{5}{9} + \frac{1}{9}$	$\frac{1}{10} + \frac{1}{10}$	$\frac{3}{16} + \frac{5}{16}$
4.	$\frac{3}{10} + \frac{3}{10}$	$\frac{4}{7} + \frac{3}{7}$	$\frac{5}{10} + \frac{3}{10}$

Sometimes you have to find the simplest name for the answer to a subtraction problem, too. Remember how to subtract.

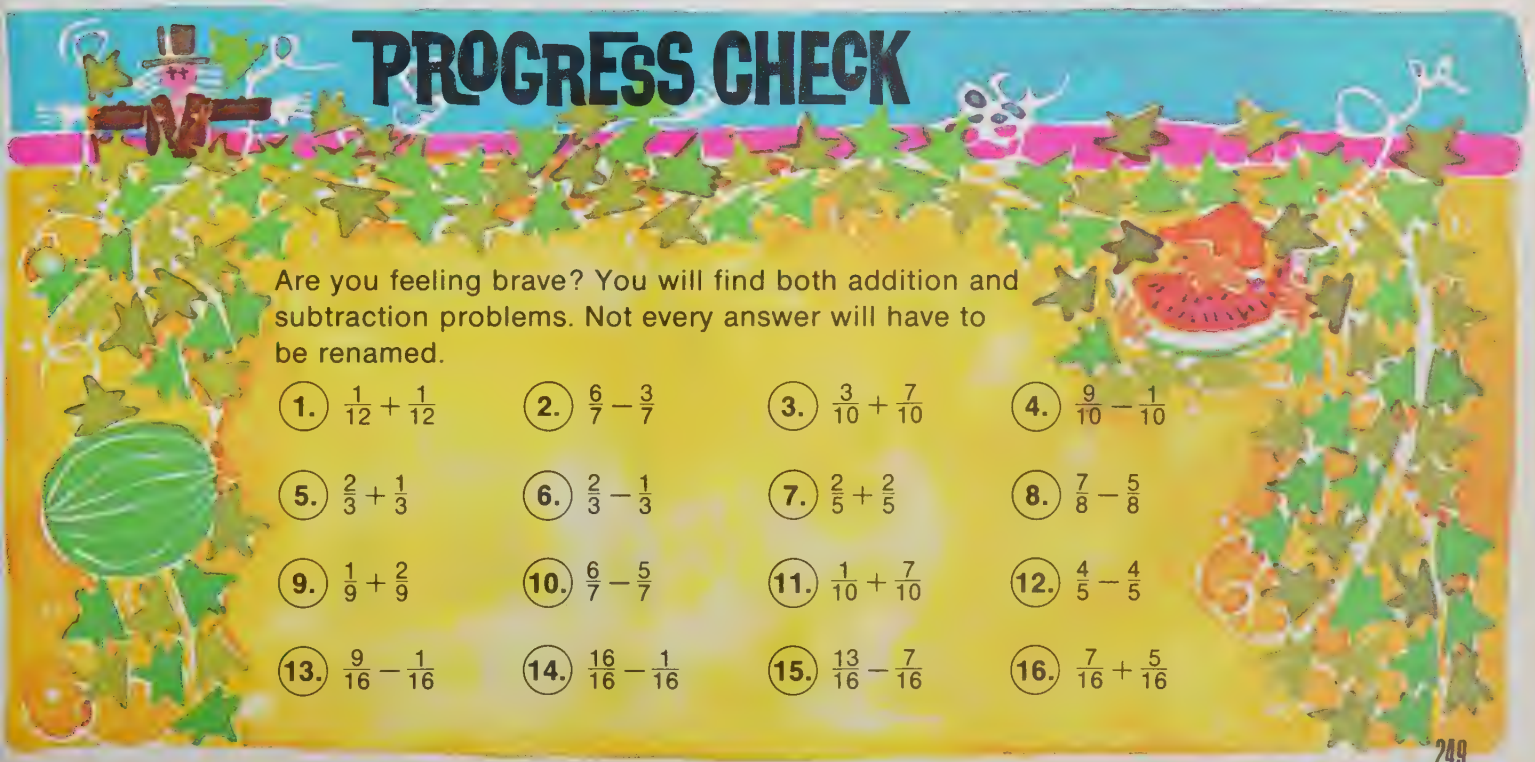
$\frac{7}{12} - \frac{3}{12} = \frac{7-3}{12} = \frac{4}{12}$ Rename. Is there a common factor?

$\frac{4}{12} = \frac{4 \div 4}{12 \div 4} = \frac{1}{3}$ That's the simplest name.

YOUR TURN

Subtract and rename the answers.

	a	b	c	d
1.	$\frac{5}{6} - \frac{1}{6}$	$\frac{7}{10} - \frac{3}{10}$	$\frac{7}{8} - \frac{1}{8}$	$\frac{11}{12} - \frac{7}{12}$
2.	$\frac{7}{9} - \frac{4}{9}$	$\frac{3}{4} - \frac{1}{4}$	$\frac{5}{8} - \frac{3}{8}$	$\frac{9}{10} - \frac{7}{10}$

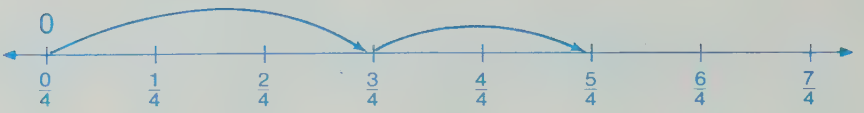


PROGRESS CHECK

Are you feeling brave? You will find both addition and subtraction problems. Not every answer will have to be renamed.

(1.) $\frac{1}{12} + \frac{1}{12}$	(2.) $\frac{6}{7} - \frac{3}{7}$	(3.) $\frac{3}{10} + \frac{7}{10}$	(4.) $\frac{9}{10} - \frac{1}{10}$
(5.) $\frac{2}{3} + \frac{1}{3}$	(6.) $\frac{2}{3} - \frac{1}{3}$	(7.) $\frac{2}{5} + \frac{2}{5}$	(8.) $\frac{7}{8} - \frac{5}{8}$
(9.) $\frac{1}{9} + \frac{2}{9}$	(10.) $\frac{6}{7} - \frac{5}{7}$	(11.) $\frac{1}{10} + \frac{7}{10}$	(12.) $\frac{4}{5} - \frac{4}{5}$
(13.) $\frac{9}{16} - \frac{1}{16}$	(14.) $\frac{16}{16} - \frac{1}{16}$	(15.) $\frac{13}{16} - \frac{7}{16}$	(16.) $\frac{7}{16} + \frac{5}{16}$

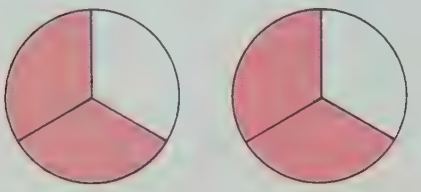
1. Dan is a mountain climber.
He climbed for $\frac{3}{4}$ of an hour. Then he rested.
Then he climbed for another $\frac{2}{4}$ of an hour.
Did he climb more than one hour? How long in all?



$\frac{3}{4} + \frac{2}{4} = \frac{?}{4}$

This problem signals the next step in operations with fractions. Take a good look at your answer. What looks different about that fraction?

2. Here's another example to study.



How many thirds are shaded?

$\frac{2}{3} + \frac{2}{3} = \frac{?}{3}$

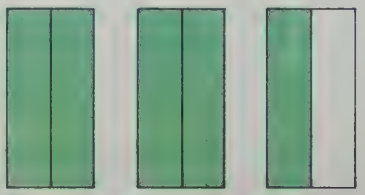
Hey! The numerator is greater than the denominator again.

You have named a fraction greater than 1. $\frac{4}{3}$ is another name for $1\frac{1}{3}$.

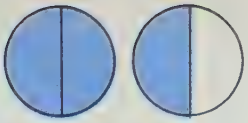
3. How many halves are shaded?
How many whole regions are shaded?

a How many more halves than two whole regions are shaded?

b Is the sentence $\frac{5}{2} = 2\frac{1}{2}$ true?



Do you remember? $1\frac{1}{4}$ is called a *mixed number*. So are $1\frac{1}{3}$ and $2\frac{1}{2}$.

$\frac{1}{2} < 1$ $\frac{2}{2} = 1$  $\frac{3}{2} > 1$

Compare the numerator with the denominator.
Are these statements true?

1. When the numerator is smaller than the denominator, the fraction is less than 1.
2. When the numerator is the same number as the denominator, the fraction is equal to 1.
3. When the numerator is greater than the denominator, the fraction is greater than 1.

Are the statements true for thirds?

$\frac{1}{3} < 1$ $\frac{2}{3} < 1$ $\frac{3}{3} = 1$ $\frac{4}{3} > 1$

Are the statements true for fourths?

$\frac{1}{4} < 1$ $\frac{2}{4} < 1$ $\frac{3}{4} < 1$ $\frac{4}{4} = 1$ $\frac{5}{4} > 1$

Try to find a time when the statements are not true.

Use $>$, $<$, or $=$ to replace the ?. Draw a picture if you need to.

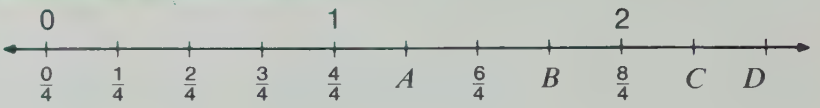
	a	b	c	d	e	f	g
4.	$\frac{5}{6}$? 1	$\frac{5}{2}$? 1	$\frac{6}{6}$? 1	$\frac{2}{5}$? 1	$\frac{1}{9}$? 1	$\frac{6}{4}$? 1	$\frac{9}{3}$? 1
5.	$\frac{0}{4}$? 1	$\frac{5}{5}$? 1	$\frac{12}{1}$? 1	$\frac{1}{12}$? 1	$\frac{12}{12}$? 1	$\frac{7}{6}$? 1	$\frac{8}{8}$? 1

1. How many fourths are shaded?

$\frac{2}{4} + \frac{3}{4} = \frac{?}{4}$

Does this fraction name a number greater than 1?
What is another name for the sum?

2. What are the missing fractions?



a Is $\frac{4}{4}$ another name for 1?

b Is $1\frac{1}{4}$ more than 1? How much more? Is $1\frac{1}{4}$ a mixed number?

c What is another name for $\frac{8}{4}$? Does $\frac{8}{4}$ name a mixed number?

3. Don't rename. Just tell which fractions

can be renamed as mixed numbers. Draw diagrams if you need help.

a $\frac{3}{2}$ **b** $\frac{5}{4}$ **c** $\frac{7}{4}$ **d** $\frac{3}{4}$ **e** $\frac{12}{15}$ **f** $\frac{7}{3}$

g How did you decide which numbers were mixed numbers?

*4. Copy and complete the chart.

ate	ate	Did they eat more than 1 whole thing?
$\frac{1}{4}$ of a melon	$\frac{1}{2}$ of a melon	yes ? no
$\frac{1}{4}$ of a cake	$\frac{1}{3}$ of a cake	yes ? no
$\frac{1}{4}$ of a pie	$\frac{7}{8}$ of a pie	yes ? no

Who had a bigger appetite?

$\frac{3}{5} + \frac{4}{5} = \frac{3+4}{5} = \frac{7}{5}$ $\frac{5}{5}$ names 1 and there is another $\frac{2}{5}$.

So $\frac{7}{5} = 1\frac{2}{5}$

$\frac{2}{3} + \frac{2}{3} = \frac{2+2}{3} = \frac{4}{3}$ $\frac{3}{3}$ names 1 and there is another $\frac{1}{3}$.

So $\frac{4}{3} = 1\frac{1}{3}$

$\frac{5}{7} + \frac{3}{7} = \frac{5+3}{7} = \frac{8}{7}$ **Think** $\frac{7}{7}$ names 1. There is another $\frac{1}{7}$.

So $\frac{8}{7} = \underline{?}$

Look out!

$\frac{5}{9} + \frac{4}{9} = \frac{5+4}{9} = \underline{?}$ What is another name?
Is it a mixed number?

Keep on your toes!

$\frac{5}{8} + \frac{1}{8} = \frac{5+1}{8} = \underline{?}$ What is another name? Is it a mixed number?

$\frac{4}{7} + \frac{1}{7} = \frac{4+1}{7} = \underline{?}$ Is there another name?

Remember please

Fractions greater than 1 can be renamed.
Fractions that are equal to 1 can be renamed.
Some fractions less than 1 can be renamed.

All these fractions can be renamed. Do a good job.

1. $\frac{6}{5}$
2. $\frac{7}{4}$
3. $\frac{5}{3}$
4. $\frac{3}{2}$
5. $\frac{6}{6}$
6. $\frac{9}{7}$
7. $\frac{11}{6}$
8. $\frac{5}{4}$
* 9. $\frac{9}{3}$
* 10. $\frac{4}{2}$

Now that you have reviewed mixed numbers,
find out when you might run into one of them.

$$\frac{3}{4}+\frac{3}{4}=\frac{3+3}{4}=\frac{6}{4}$$ Aha! There is a mixed number!

A Ask first, do the numerator and denominator have a common factor? $\frac{6 \div 2}{4 \div 2}=\frac{3}{2}$
Now rename. What mixed number does $\frac{3}{2}$ name?

Look at these three examples.
The idea of common factor will help you rename.

B $\frac{5}{6}+\frac{5}{6}=\frac{5+5}{6}=\frac{10}{6}$ — Common factor? $\frac{10 \div 2}{6 \div 2}=\frac{5}{3}$
Now rename so that you have a mixed number.

C $\frac{3}{5}+\frac{4}{5}=\frac{3+4}{5}=\frac{7}{5}$ — Common factor?
Rename as a mixed number.

D $\frac{1}{2}+\frac{1}{2}=\frac{1+1}{2}=\frac{2}{2}$ — Common factor? You don't have to write anything. You know the number that kind of fraction names.

You are ready to practise.
Add. Rename the answer so that it has its simplest name.

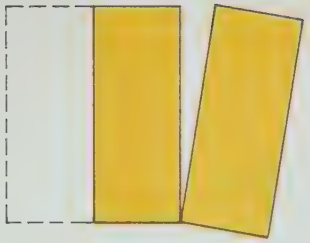
Boys do these.

1. $\frac{3}{4}+\frac{1}{4}$ 2. $\frac{4}{7}+\frac{6}{7}$ 3. $\frac{4}{5}+\frac{2}{5}$ 4. $\frac{9}{10}+\frac{1}{10}$
5. $\frac{1}{6}+\frac{5}{6}$ 6. $\frac{5}{8}+\frac{6}{8}$ 7. $\frac{3}{8}+\frac{5}{8}$ 8. $\frac{4}{8}+\frac{7}{8}$

Girls do these.

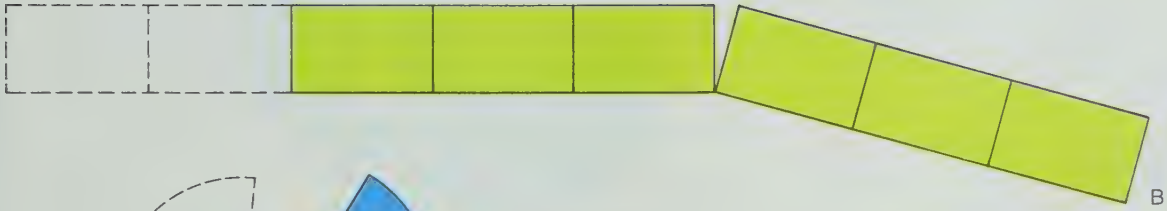
1. $\frac{4}{5}+\frac{4}{5}$ 2. $\frac{2}{4}+\frac{3}{4}$ 3. $\frac{7}{8}+\frac{5}{8}$ 4. $\frac{3}{7}+\frac{6}{7}$
5. $\frac{1}{6}+\frac{5}{6}$ 6. $\frac{1}{10}+\frac{9}{10}$ 7. $\frac{5}{8}+\frac{4}{8}$ 8. $\frac{7}{9}+\frac{4}{9}$

Time out to review subtraction



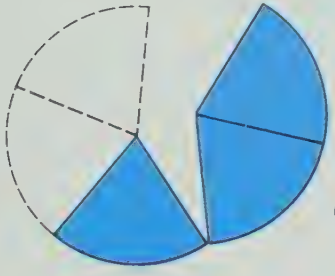
There were $\frac{3}{3}$.
Now there are $\frac{2}{3}$.
Take $\frac{1}{3}$ from $\frac{2}{3}$.

A $\frac{2}{3} - \frac{1}{3} = \underline{?}$



There were $\frac{8}{8}$.
Now there are $\frac{6}{8}$.
Take $\frac{3}{8}$ from $\frac{6}{8}$.

B $\frac{6}{8} - \frac{3}{8} = \underline{?}$



There were $\frac{5}{5}$.
Now there are $\frac{3}{5}$.
Take $\frac{2}{5}$ from $\frac{3}{5}$.

C $\frac{3}{5} - \frac{2}{5} = \underline{?}$

Practise subtraction. Rename when you can.

	a	b	c	d
1.	$\frac{3}{4} - \frac{1}{4} = \underline{?}$	$\frac{7}{8} - \frac{3}{8} = \underline{?}$	$\frac{4}{9} - \frac{2}{9} = \underline{?}$	$\frac{7}{12} - \frac{3}{12} = \underline{?}$
2.	$\frac{5}{6} - \frac{1}{6} = \underline{?}$	$\frac{6}{7} - \frac{5}{7} = \underline{?}$	$\frac{7}{9} - \frac{3}{9} = \underline{?}$	$\frac{5}{12} - \frac{3}{12} = \underline{?}$
3.	$\frac{3}{4} - \frac{1}{4} = \underline{?}$	$\frac{4}{5} - \frac{2}{5} = \underline{?}$	$\frac{4}{5} - \frac{1}{5} = \underline{?}$	$\frac{5}{8} - \frac{3}{8} = \underline{?}$

This kind of picture can show subtraction too.

$$\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$$

$$\frac{5}{6} - \frac{3}{6} = \frac{2}{6}$$

Subtract. Rename when you can.

1. $\frac{3}{3} - \frac{2}{3}$	**2.** $\frac{4}{5} - \frac{1}{5}$	**3.** $\frac{2}{2} - \frac{1}{2}$
4. $\frac{3}{6} - \frac{2}{6}$	**5.** $\frac{4}{7} - \frac{2}{7}$	**6.** $\frac{6}{8} - \frac{3}{8}$
7. $\frac{1}{4} - \frac{1}{4}$	**8.** $\frac{3}{9} - \frac{1}{9}$	**9.** $\frac{3}{9} - \frac{2}{9}$
10. $\frac{7}{11} - \frac{4}{11}$	**11.** $\frac{2}{3} - \frac{1}{3}$	**12.** $\frac{2}{4} - \frac{1}{4}$
13. $\frac{4}{5} - \frac{3}{5}$	**14.** $\frac{7}{7} - \frac{7}{7}$	**15.** $\frac{1}{2} - \frac{0}{2}$
16. $\frac{4}{6} - \frac{3}{6}$	**17.** $\frac{7}{9} - \frac{4}{9}$	**18.** $\frac{7}{9} - \frac{3}{9}$

Practise your renaming skills in the subtraction problems.
Rename the answers so that each has its simplest name.

	a	b	c	d
1.	$\frac{5}{6}-\frac{1}{6}$	$\frac{7}{8}-\frac{3}{8}$	$\frac{3}{4}-\frac{1}{4}$	$\frac{7}{10}-\frac{5}{10}$
2.	$\frac{5}{8}-\frac{3}{8}$	$\frac{11}{12}-\frac{5}{12}$	$\frac{7}{9}-\frac{1}{9}$	$\frac{7}{8}-\frac{1}{8}$

Now try it with addition.
Rename the answers so that each has its simplest name.
You might name some mixed numbers, too.

	a	b	c	d
3.	$\frac{1}{4}+\frac{1}{4}$	$\frac{1}{8}+\frac{7}{8}$	$\frac{1}{6}+\frac{5}{6}$	$\frac{1}{8}+\frac{5}{8}$

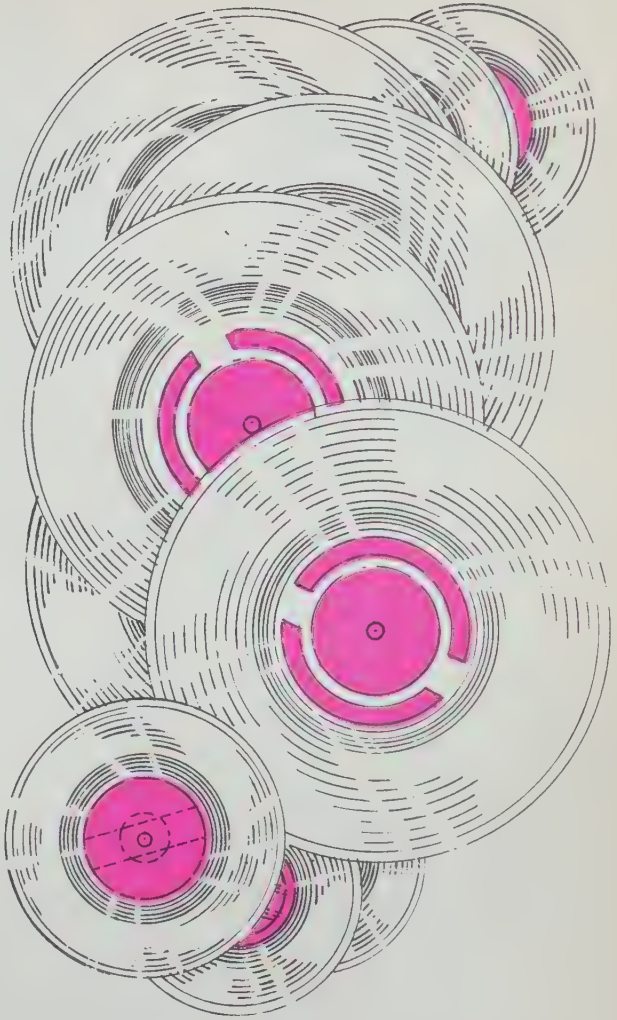
Look out. These are only for the very brave.

	a	b	c	d
***4.**	$\frac{7}{10}+\frac{9}{10}$	$\frac{5}{6}+\frac{5}{6}$	$\frac{7}{8}+\frac{5}{8}$	$\frac{3}{4}+\frac{3}{4}$

Answer these with a fraction. The simplest names, please.

5. There were 12 records.
You got 4. I got 2.
What part of the 12 records did you get?
What part of the 12 records did I get?
What part of the 12 records is left?

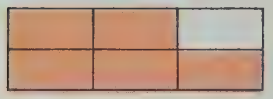
6. There were 6 posters.
Ron got 2. Don got 3.
What part of the 6 posters did Ron get?
What part of the 6 posters did Don get?
What part of the 6 posters is left?



CHECKOUT

1. Which fraction names each picture?

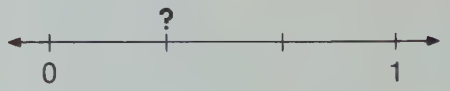
a



b

c

d



2. Draw a picture to show $\frac{1}{2}$. Draw one to show $\frac{2}{3}$. Draw another one to show $\frac{5}{8}$.

3. Which is greater?

a $\frac{1}{3}$ or $\frac{2}{3}$ **b** $\frac{3}{4}$ or $\frac{2}{4}$ **c** $\frac{5}{6}$ or $\frac{1}{6}$ **d** $\frac{7}{9}$ or $\frac{5}{9}$

4. Add. Rename when you can.

a $\frac{3}{5}+\frac{1}{5}$ **b** $\frac{2}{6}+\frac{1}{6}$ **c** $\frac{2}{3}+\frac{1}{3}$ **d** $\frac{5}{6}+\frac{1}{6}$

***e** $\frac{3}{8}+\frac{7}{8}$ ***f** $\frac{7}{12}+\frac{9}{12}$ ***g** $\frac{3}{10}+\frac{2}{10}$ ***h** $\frac{7}{8}+\frac{5}{8}$

5. Subtract. Rename when you can.

a $\frac{2}{3}-\frac{1}{3}$ **b** $\frac{4}{5}-\frac{1}{5}$ **c** $\frac{4}{6}-\frac{3}{6}$ **d** $\frac{5}{8}-\frac{3}{8}$

e $\frac{9}{10}-\frac{3}{10}$ **f** $\frac{3}{4}-\frac{1}{4}$ **g** $\frac{7}{8}-\frac{1}{8}$ **h** $\frac{8}{9}-\frac{2}{9}$

12

MEASUREMENT MONEY AND MASS

YOUR GOAL

is to find out about money

1. **a** How many pennies in one dollar?
   b One penny is what fraction of one dollar?

2. **a** How many pennies in one nickel?
   b How many nickels in one dollar?
   c One nickel is what fraction of one dollar?
   d Five pennies are what fraction of one dollar?

3. **a** How many pennies in one dime?
   b How many dimes in one dollar?
   c One dime is what fraction of one dollar?
   d Ten pennies are what fraction of one dollar?

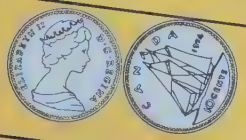
   a How many pennies in one quarter?
   b How many quarters in one dollar?
   c One quarter is what fraction of one dollar?
   d Twenty-five pennies are what fraction of one dollar?

5. **a** How many pennies in a half dollar?
   b How many half dollars in one dollar?
   c One half dollar is what fraction of one dollar?
   d Fifty pennies are what fraction of one dollar?

Do some research. Find out what kinds of paper money are printed by the government now.

One penny is called one cent, but its value is one-hundredth of a dollar. You know that \$0.01, $\frac{1}{100}$ of a dollar, and 1¢ are all names for a penny. 0.01 is called a decimal fraction and has a decimal point.

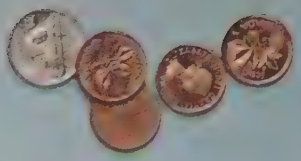
Complete the following. Give the decimal fraction and common fraction for each sum of money.

	Write what fraction of a dollar	Write the value with a decimal
1.	a $\frac{2}{100}$	b \$0.02
2.	a $\frac{15}{100}$	b ?
3. 	a ?	b ?
4.	a ?	b ?
5.	a ?	b ?
6.	a ?	b ?
7	a ?	b ?
8.	a ?	b ?

Here are some sets of coins
Write the value of each
set, using a decimal.

1.

2.



3.

4.

5.

6.

How good are you at writing how many dollars?
Prove it. Use the symbol that stands for dollar.

7.

8.

9.

It is probably silly to take too much time to practise adding or subtracting money. You have been doing that for years. But take time for a short review.

$3.98
That is the number of 1¢ coins.
The number of 10¢ coins.
The decimal point separates the dollars from cents
The number of dollars

Bill started to add some money this way. What's wrong?

$$\begin{array}{r} \$1.56 \\ +\quad 1.97 \\ \hline \end{array}$$

Cash started to subtract this way. What's wrong?

$$\begin{array}{r} \$7.27 \\ -\quad 5 \\ \hline \end{array}$$

Don't make these mistakes when you compute. Watch the signs. There are both addition and subtraction problems.

	a	b	c	d	e	f	g
1.	$4.43 +$1.26	$5.75 −$3.20	$12.56 +$ 6.11	$8.12 +$0.76	$9.56 −$0.25	$7.10 −$1.05	$3.75 +$2.25

Did you mark your answer so that it has a dollar symbol and a decimal point?

2.	$5.25 +$4.38	$3.62 +$4.57	$7.50 −$5.25	$8.25 −$2.50	$8.67 +$1.75	$6.65 +$3.35	$2.25 −$1.30

Work carefully on the next ones. Make sure your answers are reasonable.

3.	$5.00 +$5.00	$5.00 −$3.50	$3.69 +$2.31	$7.85 +$2.15	$9.00 −$7.95	$10.00 −$ 9.98	$10.00 −$ 5.01

Do you count your change?
Pretend you are in a store. You are buying lots of things. Would you be satisfied if the following happened?

1. Something cost 29¢ in all.
   You gave the clerk two quarters.
   You get back 11¢ in change. O.K.?

   What *coins* should you get back?

2. Something cost $1.26 in all.
   You gave the clerk a five-dollar bill.
   You get back $2.74. O.K.?

   What *bills* and *coins* should you get back?

3. Something cost $3.89 in all.
   You gave the clerk a five-dollar bill.
   You get back $1.11. O.K.?

   What *bills* and *coins* should you get back?

4. Something cost $1.61 in all.
   You gave the clerk two one-dollar bills and one penny. You get back $0.39. O.K.?

   What *coins* should you get back?

Counting *from* the amount spent up *to* the amount of money received is a good way to count change. Try it.

SALES TAX

On sales over one dollar, the tax shall be computed at the straight rate of 3% on even dollar amounts and the bracket system shall be used to compute the tax on amounts between even dollars.

Amount of Sale			Tax Due
$0.01	to	$0.14	None
0.15	to	0.44	$0.01
0.45	to	0.74	0.02
0.75	to	1.14	0.03
1.15	to	1.44	0.04
1.45	to	1.74	0.05
1.75	to	2.14	0.06
2.15	to	2.44	0.07
2.45	to	2.74	0.08
2.75	to	3.14	0.09
3.15	to	3.44	0.10
3.45	to	3.74	0.11
3.75	to	4.14	0.12
4.15	to	4.44	0.13
4.45	to	4.74	0.14
4.75	to	5.14	0.15
5.15	to	5.44	0.16
5.45	to	5.74	0.17
5.75	to	6.14	0.18
6.15	to	6.44	0.19
6.45	to	6.74	0.20
6.75	to	7.14	0.21
7.15	to	7.44	0.22
7.45	to	7.74	0.23
7.75	to	8.14	0.24
8.15	to	8.44	0.25
8.45	to	8.74	0.26
8.75	to	9.14	0.27
9.15	to	9.44	0.28
9.45	to	9.74	0.29
9.75	to	10.14	0.30

A tax is added to the price of things you buy in some parts of the country. Here is a table that tells how much sales tax is charged in one place.

The print is very small. Name one reason it might be so small. Who might use a table like this every day?

How much tax would you pay on each of the following purchases?

1. $0.75 **2.** $8.45

3. $3.44 **4.** $6.15

5. $0.14 **6.** $2.98

7. $8.20 **8.** $9.99

9. $1.00 **10.** $4.50

11. $7.10 **12.** $2.25

13. $5.60 **14.** $0.89

15. $0.10 **16.** $0.78

Sometimes tax is already figured into the price you pay. If this is true, you will see the words "tax included."

Do some research

What are some of the things tax money is used for?

1. What is your mass in kilograms? Check it when you get a chance to use a scale.

2. What is your mass in grams? (Remember: 1 kg = 1000 g)

3. Practise estimating in grams. Have someone in the class make up at least two of each of these masses and put them in paper bags. (They can be made up of plasticine or small jars of sand or stones.)

   50 g 100 g 200 g 300 g 500 g

   The mass can be written on the bottom of the bag so that it is not too easy to see.

Over the next few days, when you get a chance, practise estimating these masses. Without looking at what is written on the bag, hold the bag and estimate which mass it is. Write each one down in a column like this. Beside each one put a check or an X each time you get it right or wrong.

	Estimates	Right or Wrong
50 g		
100 g		
200 g		
300 g		
500 g		

4. How many different ways can you make up a kilogram with these masses if you have two of each?

Here are some things you might buy in a store. The mass of each one is about what you would find in the store.

1. Would 400 g of bread always be the same shape as the bread in the picture?

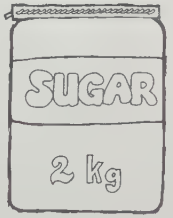
2. If you bought a small box of tea bags with a mass of 100 g, how many tea bags do you think would be in it?

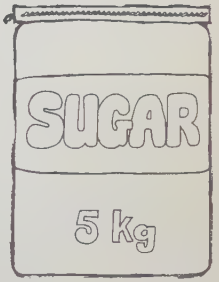
3. The jar of coffee has 100 g on the label. Does that mean:
a the coffee and the jar have a mass of 100 g altogether?
b the coffee, all by itself, has a mass of 100 g?

4. What do you think would be the usual sizes of these packages in a store near you? (They come in two or three sizes. Estimate what you think one size may be.)
a butter **b** salt **c** flour **d** canned peaches

5. Next time you are in a store, copy down the names and masses of some of these things from the labels. Or bring labels from home.

6. Look at these bags of sugar.
How many of the 500 g bags would you need to have the same amount as the 1 kg bag? the 2 kg bag? the 5 kg bag?





7. Look at these packages. They are all about the same size. Why are the masses not about the same?

In your neighborhood there is a wonderful shop. It is a small shop. It is packed full of all sorts of good things to eat.

Sometimes you want to buy everything in the shop. Sometimes you want to buy just a little of your favorite thing. And sometimes you are very, very hungry and want to buy as much as you can for your money.

The prices in the table are for items sold in the shop.

Peanuts	Mints	French almonds	Toffee	
400 g $2.00	1 kg $8.00	1 kg $5.00	100 g	$0.40
			Chocolates	
100 g $0.75	100 g $1.00	500 g $3.00	1 kg	$3.50
			500 g	$2.00

1. How much does each of the following cost?
   - **a** 200 g peanuts
   - **b** 300 g mints
   - **c** 2 kg French almonds
   - **d** 500 g mints
   - **e** 200 g toffee

2. How much does each of these cost?
   - **a** 2 kg mints
   - **b** 800 g peanuts
   - **c** 300 g toffee

Today is your lucky day. Pretend you won the door prize at the candy shop. Your prize was ten dollars. You are very hungry and decide to spend it all in the shop. You want to buy different kinds of candy and fruit. Of course you want to buy things you like. Go ahead, enjoy yourself!

Name	Package	Cost
Chocolate crunch bar	30 g	10¢
Almond bar	100 g	15¢
Chocolate bar	100 g 500 g	35¢ $1.25
Nut bar	200 g	40¢
Lemon drops	200 g bag 1000 g bag	50¢ $2.10
Toffee	500 g	40¢

1. Cost of 300 g box?
2. Cost of 1 kg?
3. Cost of 1 kg?
4. Cost of 1 kg?
5. Cost of 1 kg?
6. Cost of 1 kg?

Peanut Clusters	Peppermint Sticks	Fudge
1 kg $3.00	1 for 15¢	1 kg $2.50
500 g $1.70	5 for 50¢	250 g $0.75

1. Why do lemon-drop makers give you more lemon drops for your money if you buy a bigger package?
2. If you and a friend each want 500 g of peanut clusters, how should you buy them to save money? What will you pay? How much will you save?
3. How many peppermint sticks can you buy for $1.00? for 45¢?
4. If four friends each bought 250 g of fudge, how much would they pay all together? What does this tell you?
5. Which is cheaper — 1 kg of lemon drops or five 200 g bags? How much cheaper? Which is the better buy?
6. How much does a 2 kg box of fudge cost *per* kg? a 5 kg box?

SUPER SLEUTH

You still have $10, but this time you are buying things to feed 100 people. You won't be eating any of it. Now what will you buy?

FRUIT			
Oranges		**Watermelon**	
1 for 15¢		Whole	20¢/kg
4 for 50¢		Half	25¢/kg
Apples		**Bananas**	
500 g	30¢	500 g	10¢
1 kg	60¢	1 kg	15¢

1. Four oranges cost less *per* orange than one orange. Right? Why are oranges priced this way?
2. Why is a whole watermelon cheaper per kilogram than a cut-up one?
3. Why should you and your friend buy candy or fruit together and divide it up later?
4. Are there other things in the shop that are cheaper per kilogram if you buy more? Name some.
5. If the shopkeeper had only one of some item left, what could he do to its price?
6. If something didn't sell, what could the shopkeeper do to get more people to buy it?
7. Lots of people want a product, and the shop is running out of it. What could happen to its price?
8. No one has bought a product, and the shop has lots of it. What could happen to its price?

USE THE PRICE LISTS GIVEN FOR THE CANDY AND FRUIT SHOP TO HELP YOU DO THE FOLLOWING EXERCISES.

1. The shopkeeper has just raised the price of fudge. Why do you suppose he did that?
2. He just lowered the price of mints. Why?
3. Fifty watermelons just came into the shop. What will happen to the price of watermelons?
4. Few people want to buy French almonds, but the shop still sells them. Might the shopkeeper change the price?
5. Toffee makers have stopped making toffee. How much toffee did your class buy? What might happen to the price of the remaining toffee?
6. You own the last apple left in the world. What will you do with it? If you sell it, how much will you charge for it?

Fruits are picked at different times of the year. Most apples are picked in the fall. Oranges are picked in the winter. Watermelons are picked in the summer.

7. In the winter, shops have lots more oranges because the growers have to sell them right away. They will spoil if they are not sold. In what season are oranges the cheapest? Why?
   - **a** When are apples the cheapest? Why?
   - **b** In what season would watermelons cost the most?
8. Can you think of any other prices that change as the seasons change?

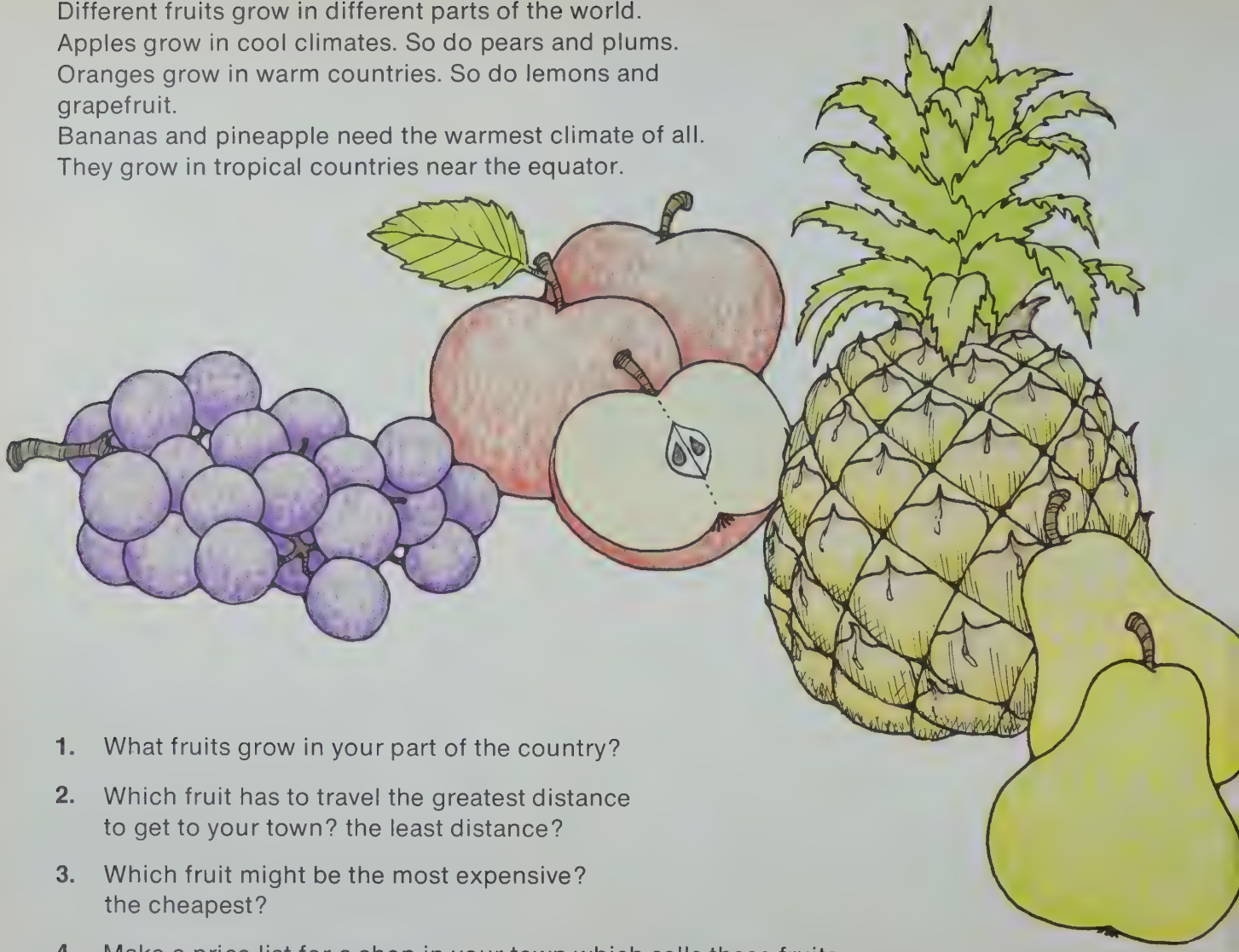
1. So far we have found two factors that might raise or lower the prices in our candy and fruit shop.
   - **a** If many people want to buy something and there is not much available, the price might go up. If no one buys an item, the price might go down.
   - **b** If it is winter, oranges will probably be cheap and watermelon will be expensive.

   There is another factor that makes some goods in the shop cheap and others expensive. Figure out what it is.

Think about these questions.

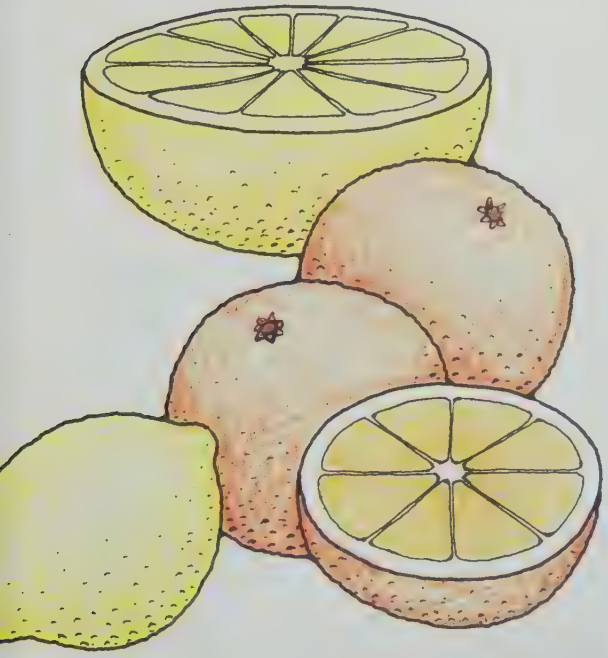
2. Which costs more?
   - **a** Toffee made by the shop owner or by a factory? Why?
   - **b** Fish caught locally or fish caught farther away? Why?
   - **c** Meat packaged locally or meat packaged 2000 km away? Why?
3. How much would a block of ice cost at the equator? at the North Pole?
4. Would a carton of eggs be more expensive in a large city or in a small town? Why?
5. Do hamburgers cost more at the foot of a mountain or at the top of the mountain? Why?
6. Why are homemade chocolate chip cookies often cheaper than those bought in a store? Why are they better?

Different fruits grow in different parts of the world.
Apples grow in cool climates. So do pears and plums.
Oranges grow in warm countries. So do lemons and grapefruit.
Bananas and pineapple need the warmest climate of all.
They grow in tropical countries near the equator.



1. What fruits grow in your part of the country?
2. Which fruit has to travel the greatest distance to get to your town? the least distance?
3. Which fruit might be the most expensive? the cheapest?
4. Make a price list for a shop in your town which sells these fruits.

You have learned so much about prices that the owner of the candy and fruit shop has decided to let you run his shop. The first thing you want to do is make sure that everything is priced right. What have you learned so far that will help you to set prices wisely?



There are a couple of other things you will need to know before you are an expert.

1. Do you know where chocolate grows? Do chocolate candies cost more than candies that aren't chocolate? Why?
2. Which candy on the list do you think is the hardest to make? How much does it cost?
3. Which candy is the easiest to make? How much does it cost?
4. Do you think a candy that is harder to make would cost more? Why?
5. The peanut-cluster maker has to pay 10¢ less per kilogram for peanuts than he used to. Do you think this will affect the price of peanut clusters?
6. The banana crop this year was much larger than usual. What could happen to the price of bananas?
7. Lack of rain ruined the crop of peaches from a large fruit-growing area. What might happen to the price of peaches?

SUPER SLEUTH

Many ads in the newspapers will say that the price is lowered or reduced. Bring in as many ads as you can that show prices.

Why might you want to have a sale?

Why might you need to have a sale?

1. You have thirty crates of oranges sitting in your shop. They are not selling. What can you do?
2. It is a week before Halloween. You have hundreds of bags of candy corn in your shop (40¢ a bag), but so do many other shops in town. How can you get people to buy Halloween candy in your shop? Why can you lower the price of the candy and still make money?
3. It is a week after Christmas. You have fifty chocolate Santa Clauses left over. Each one costs $1.00. You know they will spoil by next Christmas. What can you do to get rid of the Santa Clauses?

In each case the product can be put on sale. That means the price will be lower than usual. People will come to your shop to buy because they are getting more for their money. And when they are buying something on sale, they just might buy some lemon drops or a box of chocolates as well. Right?

Some of the advertisements you brought in probably say that a store is having a sale. Does the ad say why the store is having a sale? From what you have learned, can you guess why it might be having a sale?

Apply all the things you have learned about pricing to another store, a dime store.

1. If one pencil costs 5¢, how much might be charged for 10 pencils?
2. Scissors used to cost 60¢, but no one bought them. What happened to the price?
3. The store also sells books, about $4.00 for a hard-cover book and 95¢ for a paperback. Why are hard-cover books more expensive?
4. How will you get people to buy more than one item when they buy a product?
5. How will you attract people to your store?

CHECKOUT

Answer these. Use any ideas you have.

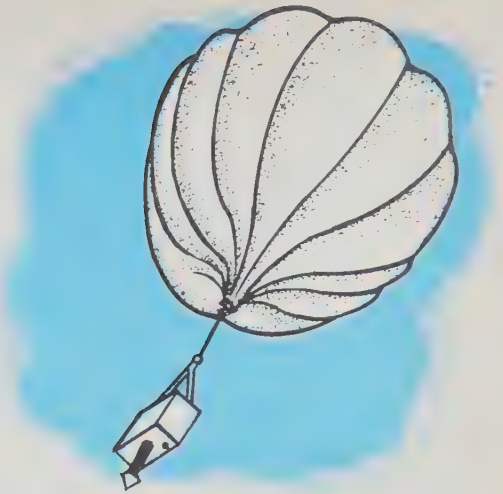
1. What things can affect the price of an item?
2. What are some of the reasons why items go on sale at a lower price?
3. Can advertising help sell items? How?
4. What is your idea of the best commercial on TV or radio? Why do you think that it is best?
5. You bought one thing for $2.98 and something else for $0.79. (The tax was included in each price.) You paid four dollars. How much money should you get back?

13 PROBABILITY

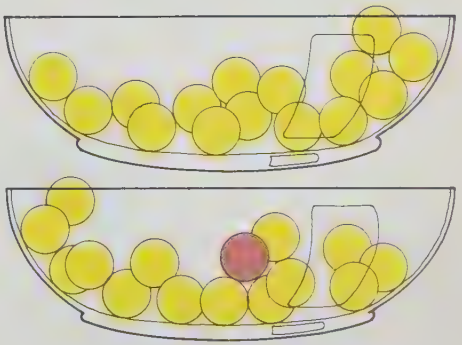
Red sky at night
The sailor's delight.
Red sky in the morning
The sailor's warning.

For years people have tried to predict the weather by various signs. (A prediction is a guess about what's going to happen in the future.)

Today the weatherman predicts tomorrow's weather. He uses all the information modern science can give him. We even have satellites in space to report on changes in the weather. Often the weatherman is right. Is he ever wrong?



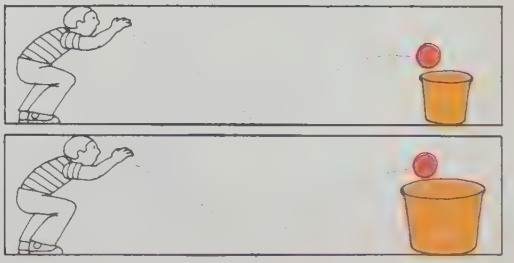
1. Let's predict some things that are simpler than the weather. The picture shows a bowl of candy. There are 15 pieces. All are lemon-flavored. If you reach in and pull one out, what flavor will you get?



a Suppose instead that the bowl has 14 lemon candies and 1 root beer candy. If you pull one out without looking, what flavor would you predict you'd get?

b There are many more lemon candies than root beer candies. So you're *more likely* to pull out a lemon candy. Does this mean you couldn't pull out the root beer piece?

2. Here's a simple game. You stand near a pail. Try to bounce a ball into the pail.



Suppose you use a bigger pail, like the one in the picture. Will this make the game easier or harder?

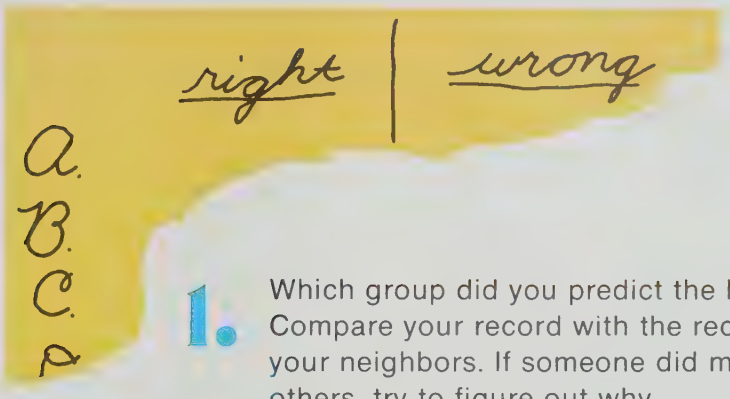
What Are the Chances? Your goal is to learn.

Lots of games use spinners. You spin the spinner. When it stops, you know how far you can move.

Here's a picture of a spinner. Part of it is plain. The other part is shaded. Do you think the spinner is more likely to stop on the plain part or the shaded part?

Try your prediction power on the following problems. Each spinner has two parts. If you could spin the spinner, where do you think it will stop? Predict whether it will stop on the plain part or the shaded part. Then look on page 288. You will see where the spinner stopped when we spun the spinner.

Make a chart like the one below. Record how well you predicted where the spinner would stop.

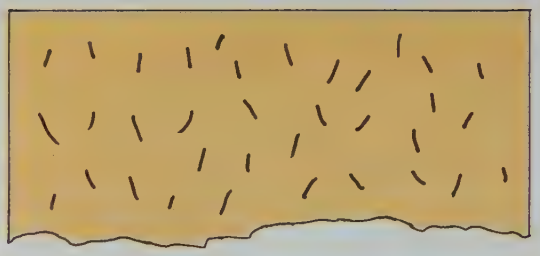


1. Which group did you predict the best? Why? Compare your record with the records of some of your neighbors. If someone did much better than the others, try to figure out why.

2. Look at the spinners in group A. The shaded part is bigger than the plain part. So the spinner is more likely to stop on the shaded part. In group B, is it more likely to stop on the plain part or the shaded part?

3. In group C the parts are exactly the same size. In this case the spinner is as likely to stop on the shaded part as on the plain part. "Shaded" and "plain" are equally likely outcomes.

Ruth had to count the people in the class play. She put a mark on a piece of paper for each person in the room. Soon her paper looked like this:



It wasn't easy to figure out how many there were!

A better way to count is to *tally* the results.
You make a short vertical mark for each thing being counted.

Things	Tally	Standard numeral
		1
		2
		3
		4

The mark for the fifth thing is put across the marks for the first four.

	𝍸	5

The next five are tallied in the same way.

	𝍸	6	(5 + 1)
	𝍸	7	(5 + 2)
	𝍸	8	(5 + 3)
	𝍸	9	(5 + 4)
	𝍸 𝍸	10	(5 + 5)

1. The tally for 11 looks like this: 𝍸 𝍸 |

a Show 12 with tally marks. **b** Show 13 with tally marks. **c** Show 15 with tally marks.

2. Write standard numerals for each of the following.

a 𝍸 |||| **b** 𝍸 𝍸 ||| **c** 𝍸 𝍸 𝍸 𝍸 |

1. Tally the number of girls in your class. Then tally the number of boys.

2. Tally the number of times the letter *e* appears on this page.

3. Flip a coin ten times. Tally the number of heads you get.

4. Suppose you flip a coin six times. How many times do you think it will be heads? How many times do you think it will be tails?

5. Actually flip a coin six times.
   - **a** Tally the number of heads.
   - **b** Also tally the number of tails.
   - **c** Was your prediction correct?

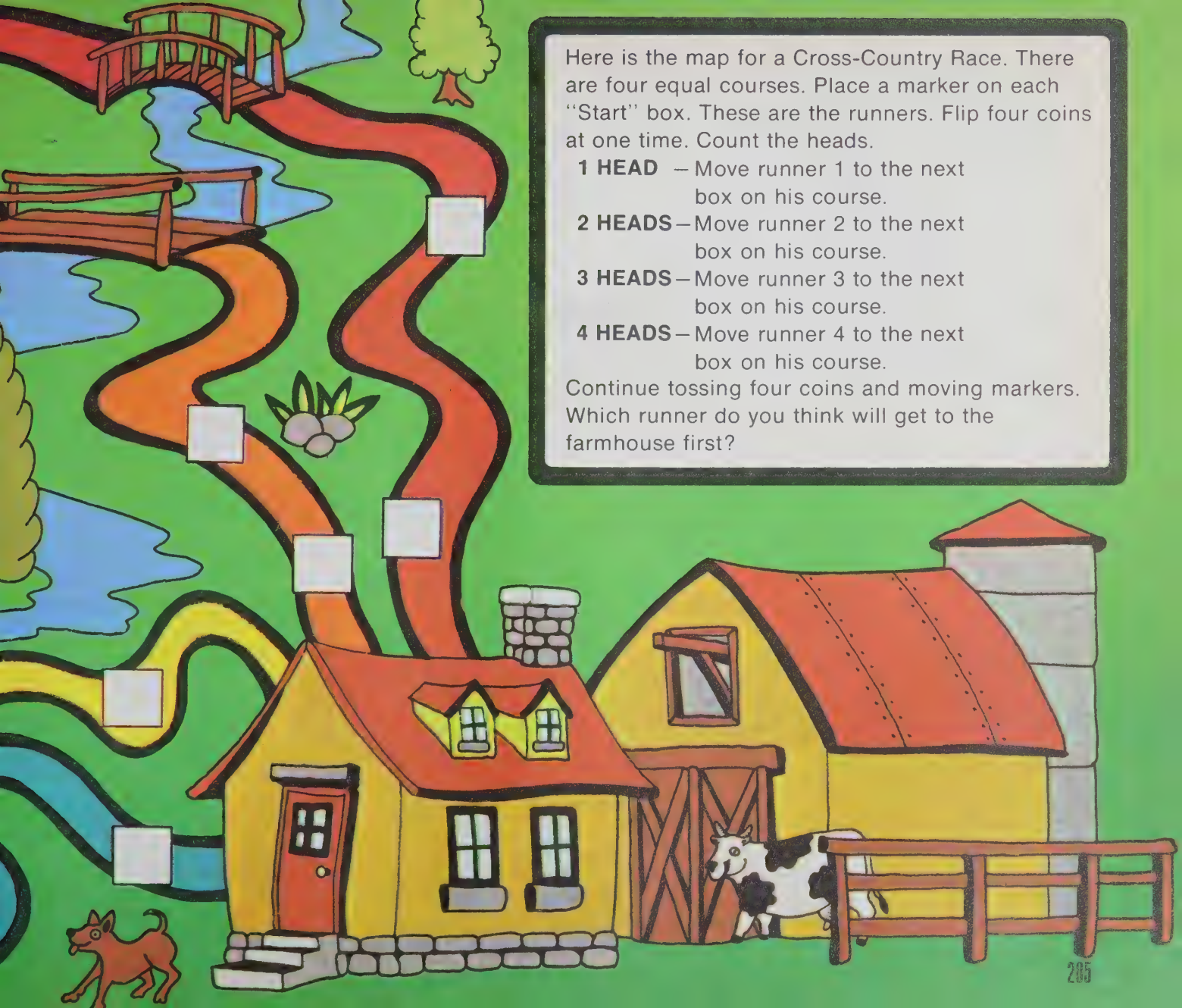
6. Repeat the experiment. That is, flip a coin six more times. Tally the number of heads and the number of tails. Were your results the same?

7. Flip a coin 30 times. Tally the number of heads. Is your result what you expected?

8. Look at your friends' results for problem 7. Make a tally like this
   Show how many got 12 heads, how many got 13 heads, and so on. Which result came up most often?

12 heads ///
13 heads 𝍸 //
and so on

1
START
2
3
4



Here is the map for a Cross-Country Race. There are four equal courses. Place a marker on each "Start" box. These are the runners. Flip four coins at one time. Count the heads.

1 HEAD – Move runner 1 to the next box on his course.

2 HEADS – Move runner 2 to the next box on his course.

3 HEADS – Move runner 3 to the next box on his course.

4 HEADS – Move runner 4 to the next box on his course.

Continue tossing four coins and moving markers. Which runner do you think will get to the farmhouse first?

1. Get two six-sided pencils.
Number the sides of each pencil from 1 through 6.
(Put a different numeral on each side.
Instead of pencils, you can use cubes.)

   a Roll one pencil. When it stops, what number is on the top side?

   b Roll the other pencil. When it stops, what number is on the top side?

   c What is the sum of the two numbers you just rolled?

2. Roll the two pencils again. What is the sum of the numbers on top this time?

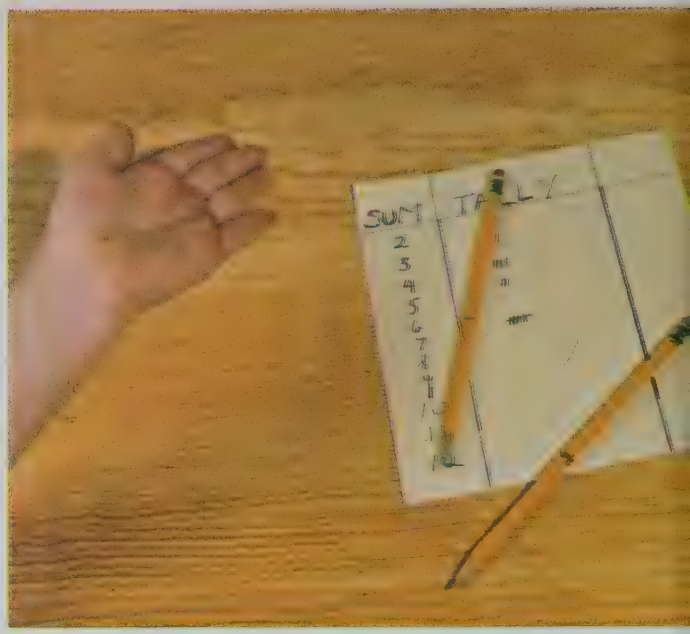
3. If you roll two pencils, what's the smallest sum you could get? What's the largest?

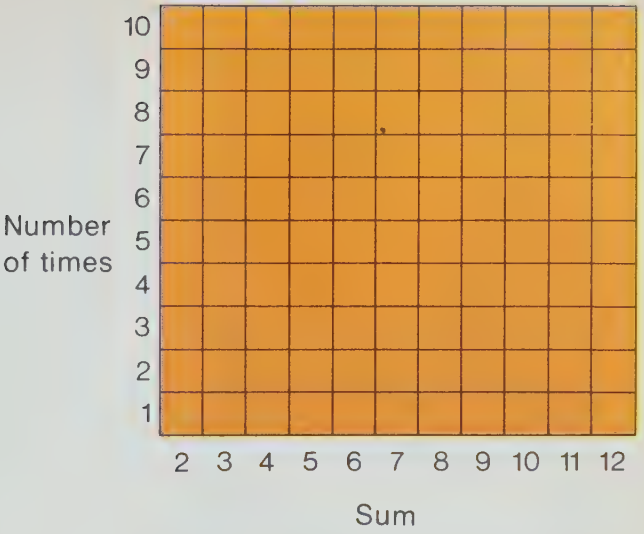
4. Make a chart like the following. Put in all the sums you could get by rolling two pencils.

SUM	TALLY
2	|||
3	
4	

   a Now roll both pencils together 36 times. Record the number of times each sum occurs. (Use your chart. Make tally marks.)

   b What sum did you get most often? least often?

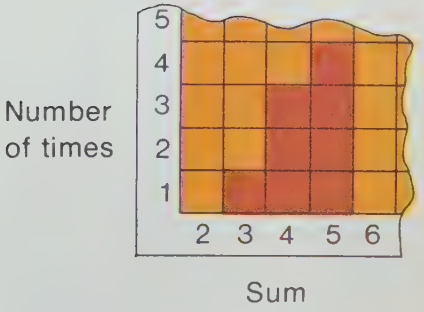




1. Copy this chart. Use graph paper. Or draw the lines yourself.

a How many times did you get the sum 2? Find 2 along the bottom of the chart. Shade in one box above 2 for each time you got the sum 2. Then shade in boxes above 3 to show how many times you got the sum 3. Do the same for 4, 5, and so on.
Example:

SUM	TALLY		
2		=	0
3	|	=	1
4	|||	=	3
5	||||	=	4



b The graph you made is called a bar graph. Is the sum that was rolled most often the easiest to find on your graph? the sum that was rolled the least often? Explain.

2. If you roll the pencils only once, what sum would you predict? Why?

CHECKOUT

1. Two runners appeared to cross the finish line at the same moment. Since there was no timer, they decided to flip a coin:

   Heads Bob wins.
   Tails Andrew wins.

   Are both outcomes equally likely?

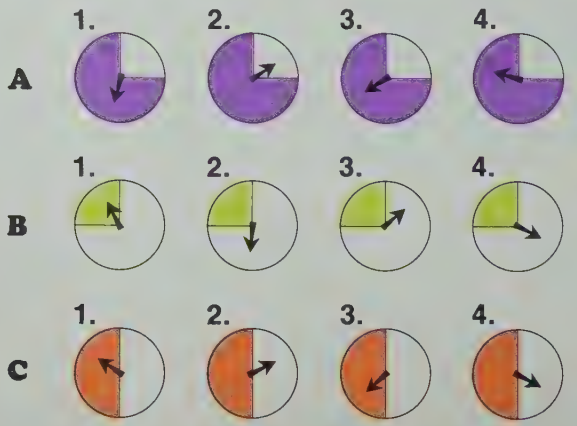
2. If you roll three pencils, what's the smallest sum you could get?

   a What's the largest?

   b Roll them 36 times. Make a chart of the sums.

   c Make a bar graph to show the sums.

This is where the spinners on page 280 stopped.



14

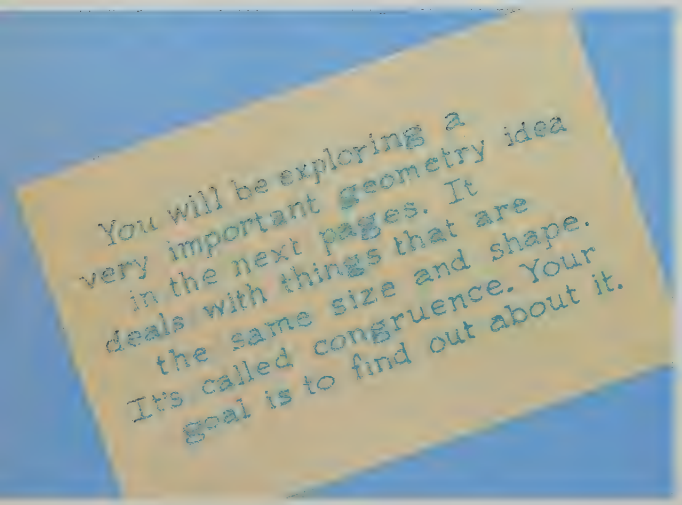
GEOMETRY CONGRUENCE

Bill and Tom want to see whether they are the same height. They measure each other. They find they are both 137 cm tall. Then they compare masses. Tom's mass is 4 kg more than Bill's.
They have found that they are the same in one way but different in another.

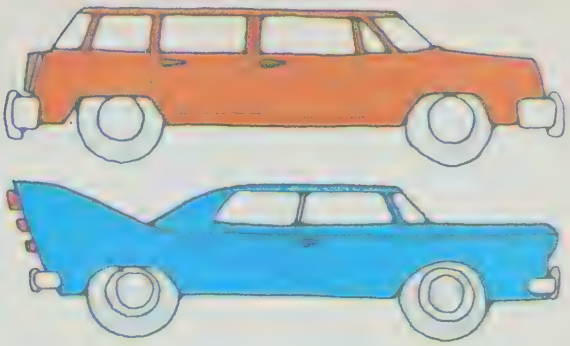
How are they the same?
How are they different?

Could the two boys have shoes of the same size?
Could they wear the same shirt size?

In what other ways could they be alike or different?


You will be exploring a very important geometry idea in the next pages. It deals with things that are the same size and shape. It's called congruence. Your goal is to find out about it.

1 Bill and Tom decide to find other things that are very much alike. Their fathers each have a car. One car is newer than the other. One car is a station wagon. The other is a sedan.



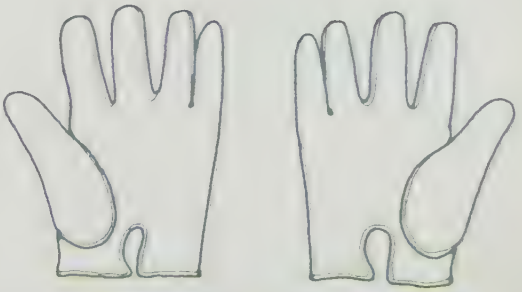
a Are the cars the same size?

b Are they the same shape?

c Is one bigger inside than the other?

d In what other ways can the two cars be compared?

2 Fred has a pair of gloves. He says they are the same. Are they? The gloves are the same size, but one is for the right hand and the other is for the left hand.

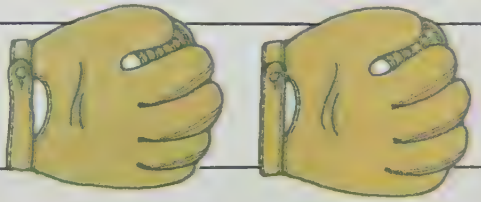


a Are they the same shape?

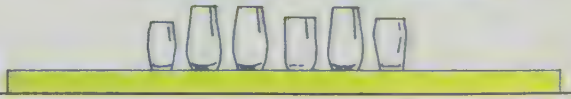
b Are they the same shape if you flip one of them over?

c Are they exactly alike?

3 Here are pictures of two baseball gloves. They are both fielders' gloves. Are they both for the same hand? How are they different?



4 Bill is setting the table for his mother. He wants the table to look nice. He uses glasses that are alike. Tell which three he used.



5 Name some pairs of things in your kitchen at home that are the same size and shape.

1

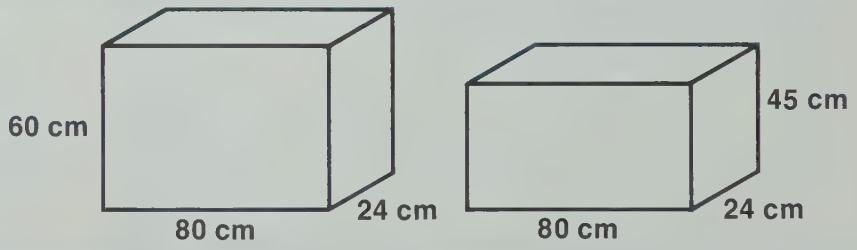
Tim has a box. He wants to find another the same size and shape. But he does not want to take his first one along. How can he be sure the box he finds is the same size and shape?

a Tim measures his box and finds it is 30 cm high. Can he be sure another box 30 cm high will be the same as his? Are these boxes the same size?

b He measures his box and finds it is 66 cm wide. This will help him find what he wants. What else must he know?

2

How are these boxes the same? How are they different?



3

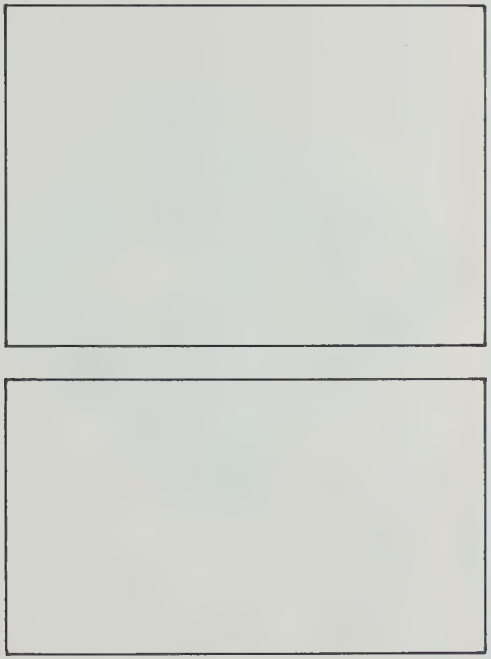
Measure one of your books. How wide is the front cover? How long is the front cover? How thick is the book?

a Now measure a book of a friend. Are the measurements the same? Are the books the same size and shape?

b Is your teacher's book different from yours? What is the difference?

1

Measure the two rectangles below. Write the measurements on a sheet of paper.



How are the two rectangles the same? Are they exactly the same? Are the opposite sides of each rectangle the same length?

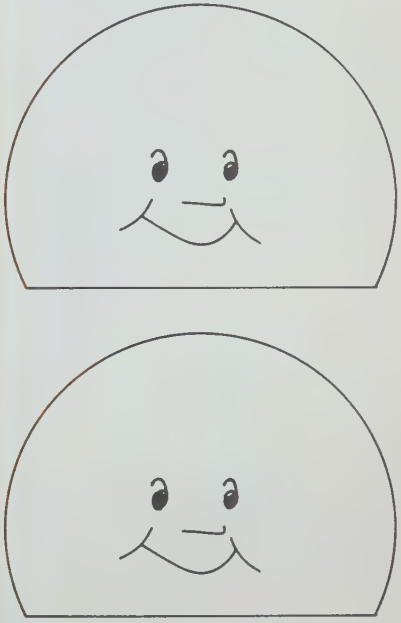
2

Take a piece of notebook paper and draw this shape on it.

The two shapes will not be the same unless you trace. How can you check whether they are the same size and shape?

3

Sally cut out place cards for her party. She wanted them the same size and shape. Here are two of them. Are they the same size and shape?



Two things that are exactly the same size and shape are *congruent.*

Are the place cards pictured above congruent?

1. Is your right shoe congruent to your left shoe?

2. Is the cover of your math book congruent to your neighbor's math book?

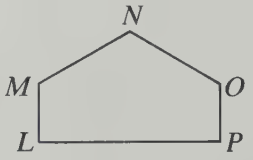
3. Are these figures congruent?

a

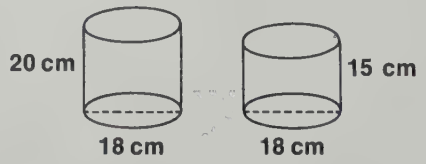
b

4. Name five pairs of things in your classroom that are congruent.

5. Draw a figure congruent to this shape. Label it the same.



6. How are these cans the same? How are they different?

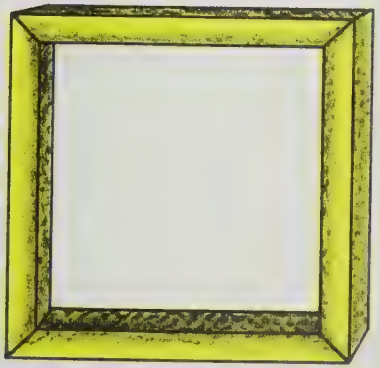


7. Name at least two things that are alike in some way but that are not congruent.

8. Name at least five pairs of things in your classroom that are alike in some way but are not congruent. Tell why each pair of things is not congruent.

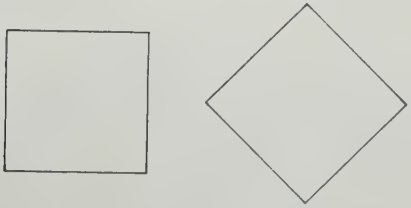
1. Alice Brandon loves old things, especially old furniture and things from old houses. One day she bought an old door with a beautiful window pane of stained glass. The pane of glass measured 60 cm on a side. Here is a drawing of it.

Alice wants to put the pane of stained glass in a window frame in her house. Can she do it?
Here is a diagram of her window frame.



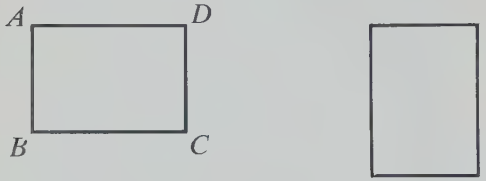
Alice thinks the stained glass pane will not fit in the frame. Will it? Prove it.

2. Do the following shapes look different? Are they congruent?

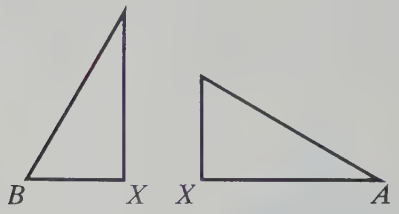


Trace the first shape. Now turn the paper a little and see whether it fits over the second shape.

1 The first rectangle below is labelled $ABCD$. Trace the second rectangle and label it the same way. Are these two rectangles congruent? How can you tell?

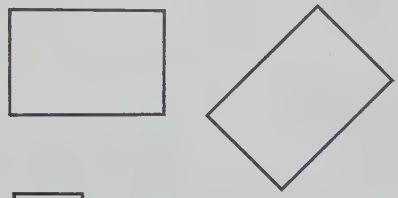


2 Trace these two triangles and finish labelling them. They should be labelled the same way. Are they congruent?

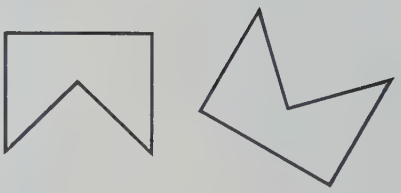


3 Which pairs of figures below are congruent? Trace the figures. Label the congruent figures with the same letters. Label the others with different letters.

a



b

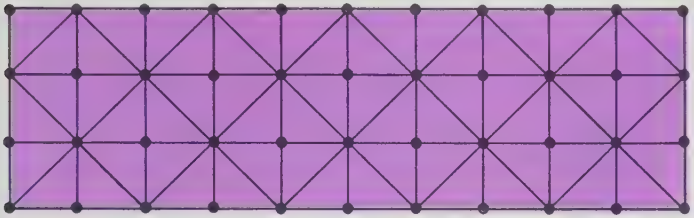


c

d

4 Take two rules of the same length. How many centimetres long is each one? Measure the width of your mathematics book with the first rule. How many centimetres is it? Measure the width with the second rule. How many centimetres this time? Are your two answers the same? Why?

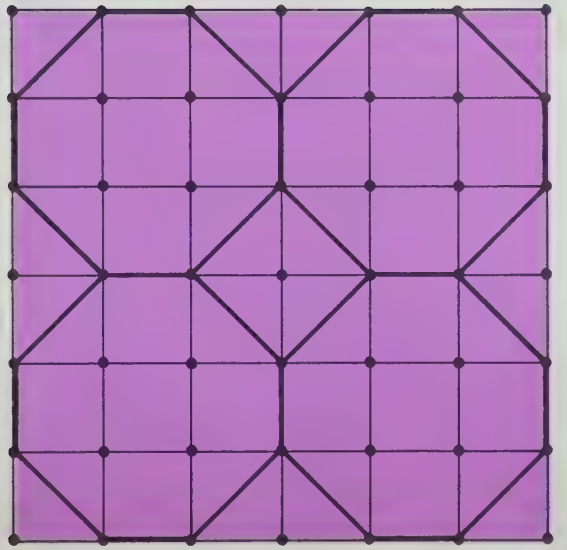
Interesting patterns can be made on squared paper using congruent shapes. Here's an idea to get you started.



1 **a** Can you see congruent squares in the outline? If you made a pattern like this and colored the square regions, you would get one design.

b Look again. Can you see congruent triangles? If you colored the triangular regions, you would get another design.

c Now look for congruent rectangles. See them? Coloring the rectangular regions would make one more design.



2 This is another interesting shape that could be used to make a design.

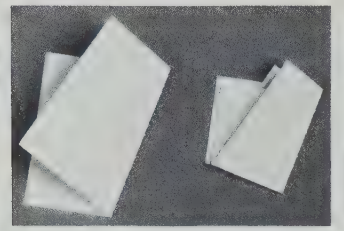
a Can you see congruent squares in the outline?

b Can you see congruent triangles, too?

3 Get some squared paper.
Make some of your own designs.

1. Make a square with sides that are at least 6 cm long. The sides can be longer if you wish.

2. Make a square-corner tester by folding paper.

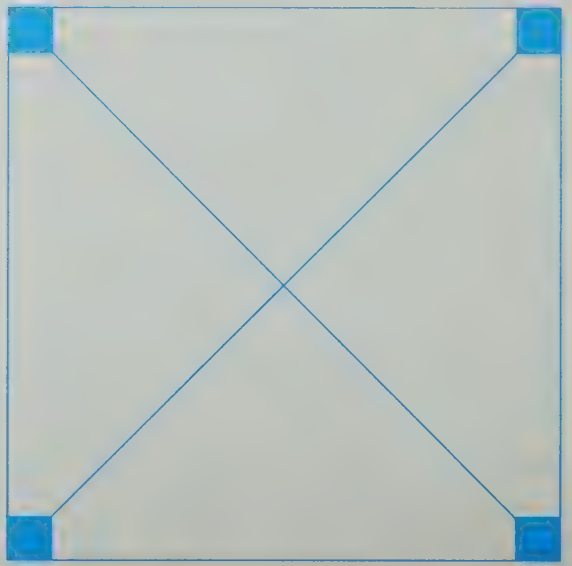


Mark each of the corners that is a square like this

3. Now draw straight line segments on your square that connect opposite corners. These line segments are called diagonals.

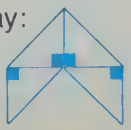
4. Measure each diagonal. Is one the same length as the other? Is one diagonal longer or shorter than one side of the square?

5. Use your square-corner tester again. Look at the point where the diagonals cross. Can you find any square corners? Mark each one that you find in the same way you did the other square corners.



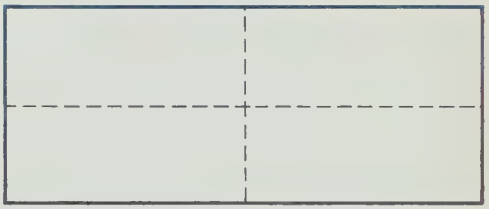
6. Cut on the diagonal lines. Make four triangles. Are the triangles congruent?

7. Fit them together so that one edge matches another edge. You can fit them together in six different ways. Here is one way: Find the other five.



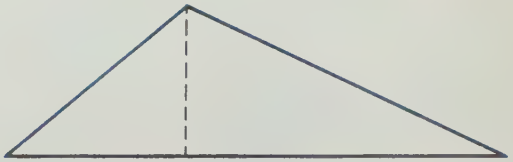
1. Some capital letters of our alphabet can be folded to have two parts the same. Which ones? Draw them on your paper. Then draw a line through each one to show that the two parts are congruent.

2. Some shapes can be divided in more than one way. Each way makes two congruent parts. Trace this figure on paper. Fold the figure along one of the dotted lines. The two parts are congruent. Unfold and fold the figure along the other dotted line. Again the two parts are congruent.

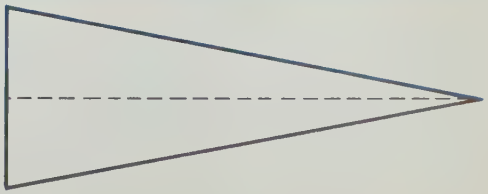


3. This is a special kind of triangle. Trace the triangle. Fold it in half along the dotted line. Do the two parts match?

4. Are the two parts of this triangle the same? Trace to prove your answer.



5. Are the two parts of this triangle the same? Trace to prove your answer.

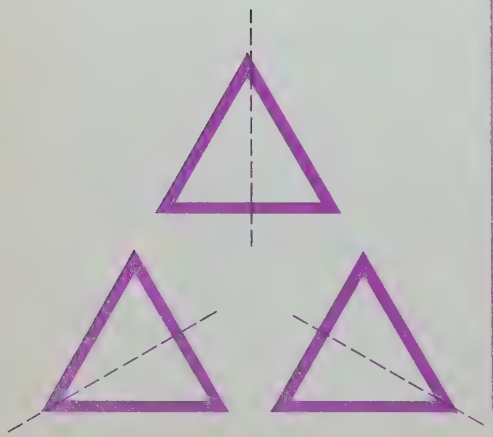


1

One kind of triangle can be folded in half in three ways. Each time the two parts are congruent.

Why can this triangle be folded in three ways? (Hint: Measure the length of each side.)

A triangle with each side the same length is called an equilateral triangle.



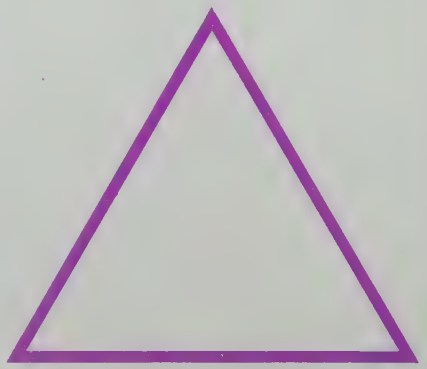
2

Is the triangle below an equilateral triangle?

a Trace it. Then cut out your triangle. Fold it in the three ways shown in problem 1. Then cut along each fold mark.

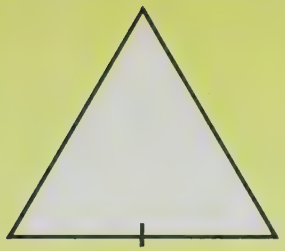
b How many triangles do you have now?

c Are the smaller triangles congruent?



3

Get two different-colored sheets of paper. Make the same-size equilateral triangle on both sheets. Fold and cut each as you did before. You will have six triangles of one color and six of another color. Fit them together to make a pattern. When you find one you like, paste it on another sheet of paper.

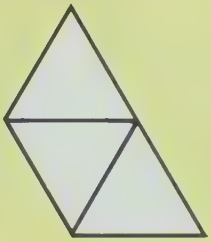


Make another equilateral triangle. Cut it out.

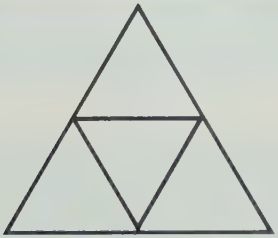
FOLD just one side so that you can find the halfway point on the edge.

NOW FOLD the top corner of the triangle down to meet the halfway point. Make a crease. Then open the triangle again.

NOW FOLD the right corner up. Make a crease mark.



OPEN AGAIN. Then fold the left corner up in the same way. Open again. You should have three fold marks.



How many small triangles in the large triangle? What fractional part is one small triangle of the large one? Cut on the fold marks so that you have four smaller triangles. Are the smaller triangles congruent?

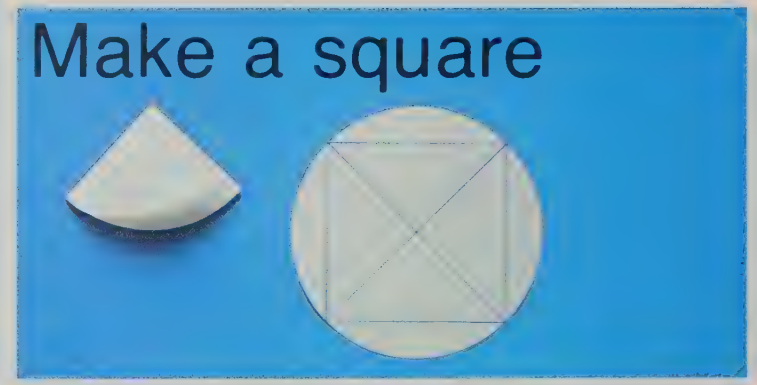
Designs like this can be made with triangles of these two sizes.

Can you find others?

MAKING MORE SHAPES

Coffee filters are great to use for the next activity. But any circular piece of paper will be fine.

1. Use a circular shape.
Fold into fourths. Open it out flat.
Mark the fold marks with pencil.
Then connect the points on the edge.
Also mark diagonals of the square.
How many triangles are formed?
Are they congruent?



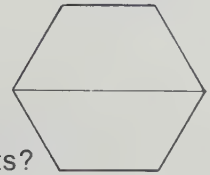
2. An octagon has eight sides.
Use another circular shape.
Fold into fourths. Then fold in half again.
You will have folded the shape into eighths.
Open it out flat.
Mark the fold marks as before.
Then connect the points on the edge.
How many triangles are formed?
Are they congruent?

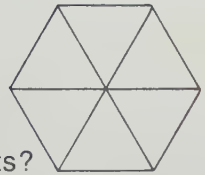
Make a hexagon

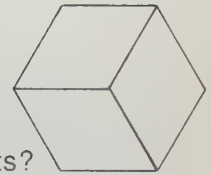
1. A hexagon has six sides.
Make one. Use another circular shape.

Fold it into fourths.
Open it that so one-half shows.
Fold edges to meet at the center.
Open the circle.
Connect the points on the edge.
You can divide this shape into triangles, too.
Try it.

2. The hexagon can be cut in many ways.

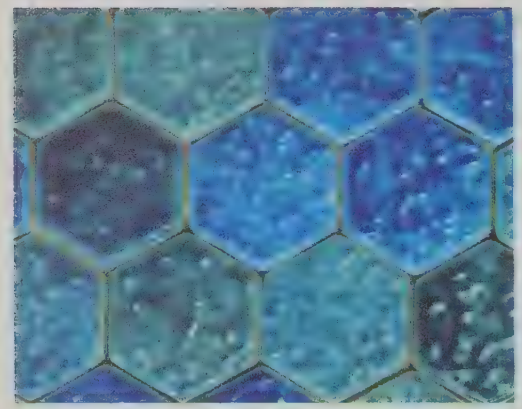
Congruent parts? 

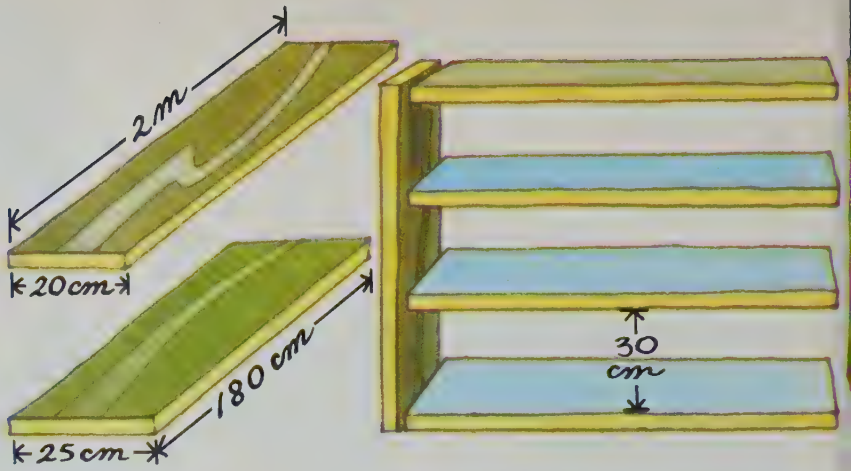
Congruent parts? 

Congruent parts? 

3. Can you find other ways to divide a hexagon into congruent parts? Try it.

4. Get some paper of different colors. Choose a part of one of the hexagons. Use it to make lots of congruent shapes. Make designs.





1

The tiles on the bathroom floor in Joan's house are all the same size and shape. Are the tiles congruent?

Make a pattern for a floor, using only a rectangular shape.

People use the idea of congruence in building things. Boards and bricks are congruent. Walls should be the same size and shape.

2

Jack wants to build a bookcase. He wants it to have four shelves. He had two boards 2 m long and 20 cm wide. He got two more boards 180 cm long and 25 cm wide.

a How can the shelves be made the same length?

b How can they be made the same width?

c Will the shelves be congruent if they are the same length and width?

d The shelves in the bookcase should be 30 cm apart. How high will the sides of the bookcase be? Look out!

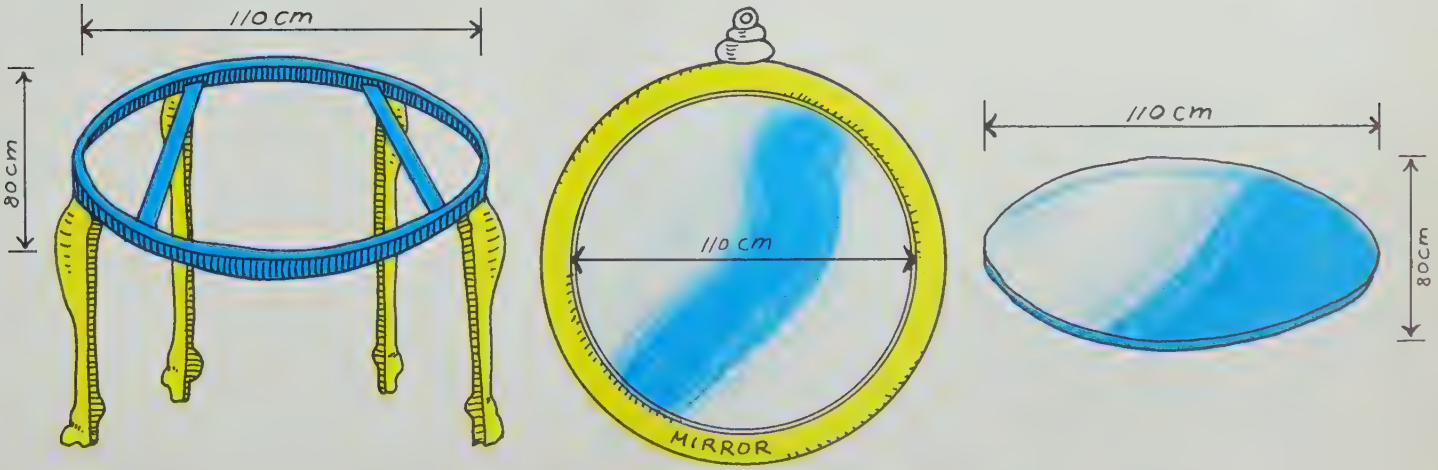
1 Here's another way that the idea of congruence is used in our world.

Mrs. Clear has an oval table with a glass top.
The top has been broken, so she needs a new glass.
Mrs. Dark offers to let her use her mirror, but
Mrs. Clear says it won't fit. Why not?

a The new glass must fit the ledge around the top of the frame. The distance across from one side to the other is 110 cm . How big must the glass be?

b Mrs. Clear decides to have the glass cut especially for her table. What shape must the glass be cut?

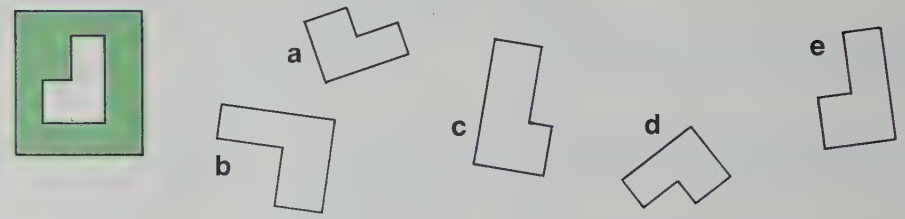
c The glass comes in two thicknesses — 10 mm and 8 mm . Does it matter which she chooses?



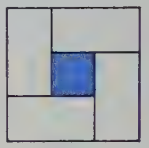
2 Name at least five other things that use the idea of congruence.

CHECKOUT

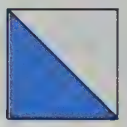
1. Name the shapes below that are congruent to the shape in the box.



2. This tile pattern is made up of more than one shape. How many shapes are there in the pattern? Use two shapes to make up a pattern of your own.

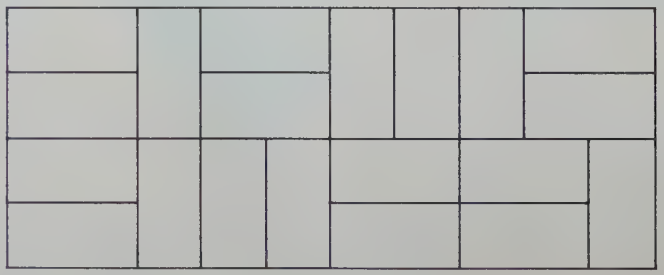


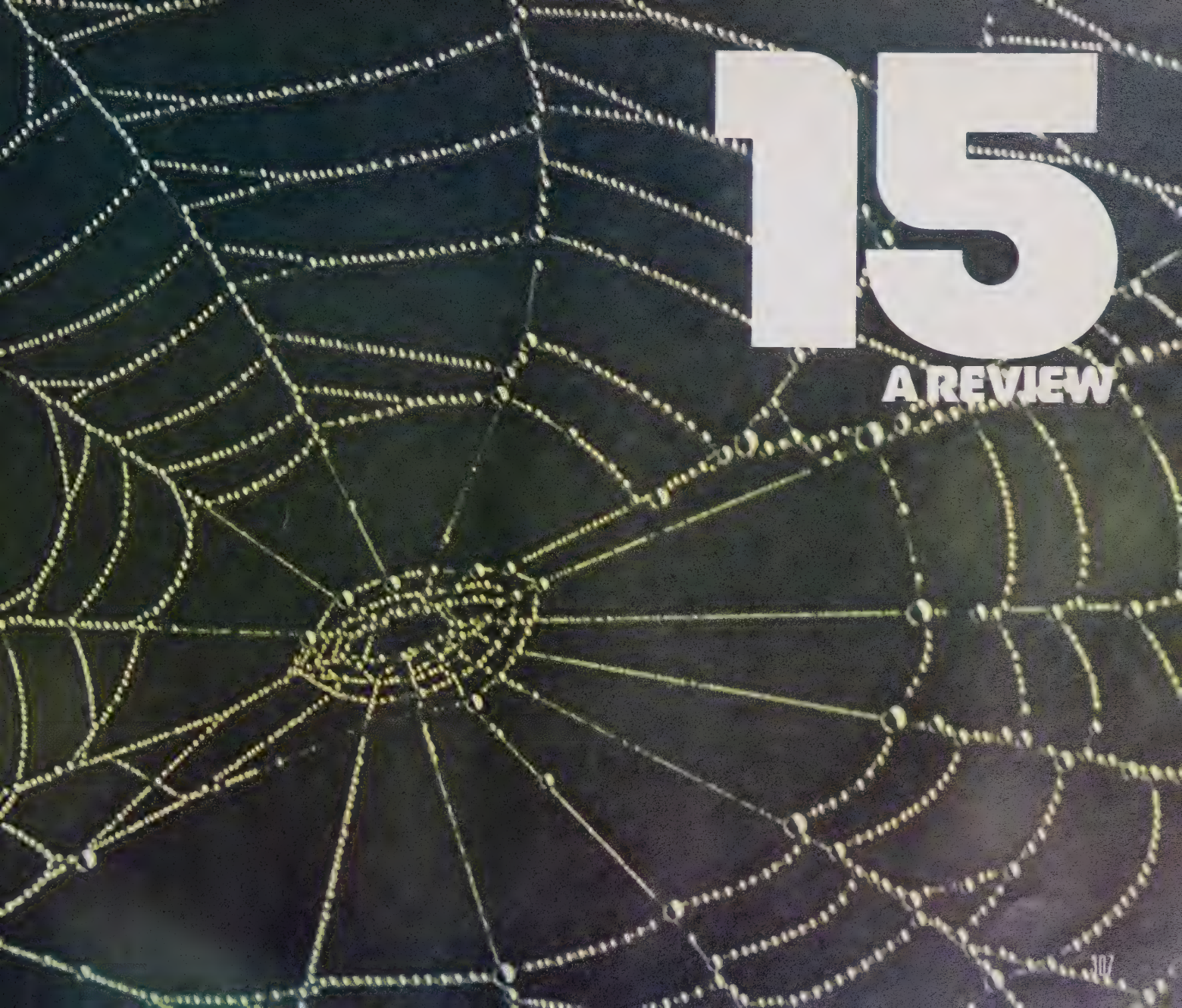
3. Beth made four clay tiles in art class. They were all alike. One looked like this:



You make four copies on paper. Show at least five different designs that Beth could have made with her tiles.

4. Are the shapes in this design congruent?





15

A REVIEW

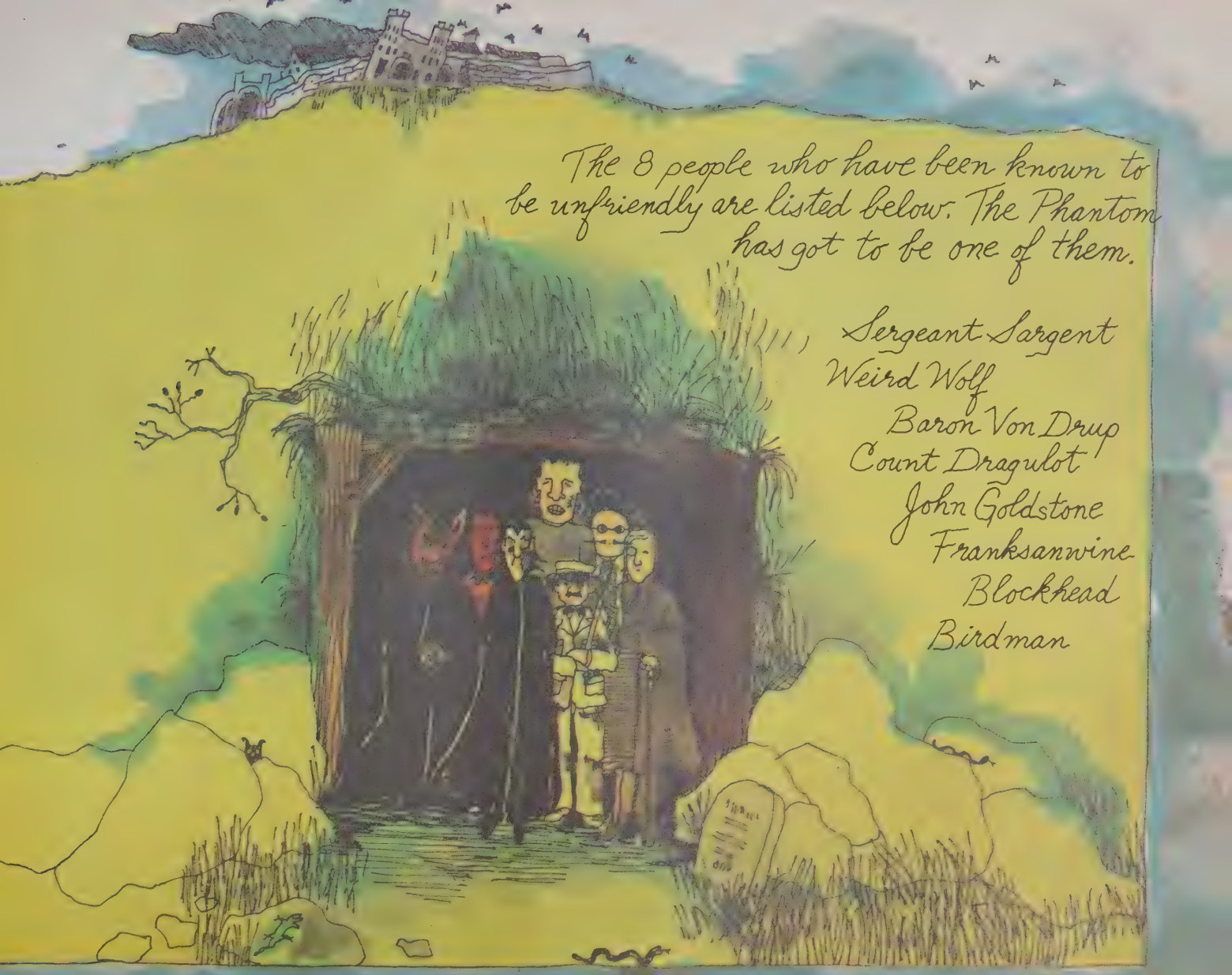
There are two reasons for you to finish this chapter.

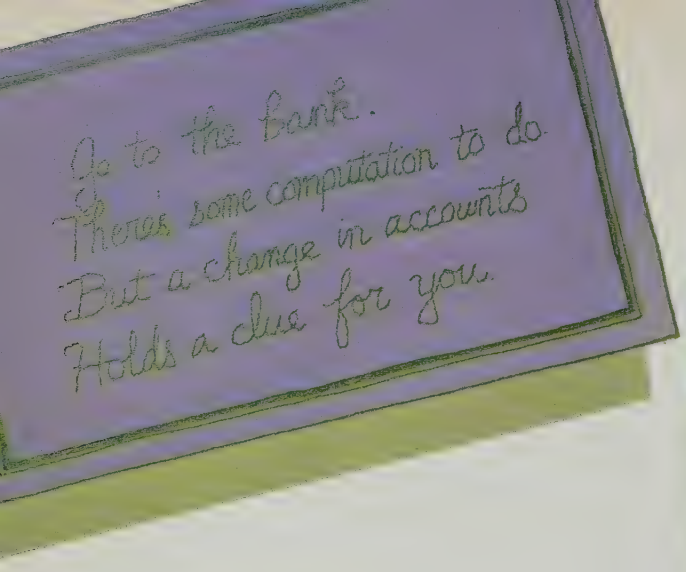
1. **To review what you have learned this year**
2. **To find the Phantom**

The Phantom must be found. He is making trouble for the 801 friendly people and the 7 unfriendly people who live in a tiny town tucked away in the mountains.

One of the 801 friendly people is a little old lady. She just loves to help the detective solve crimes. The detective doesn't know for sure which of the 401 little old ladies in the town is always helping him. He knows it is one of them, however, because she is always leaving notes for him on paper that little old ladies use. Her notes always contain some sort of clue. (She is a nosy little old lady. She always knows what's going on.) She wants the detective to work for his salary. He always has to do some work to follow up on her messages.

The detective got very sick yesterday right in the middle of a whole series of robberies. You're just going to have to help him. The little old lady's clues will be coming to you. Follow her directions carefully and you won't have to do all the work the detective sometimes has to do. Don't worry. If you miss a clue, there will be other directions to help you.


The 8 people who have been known to be unfriendly are listed below. The Phantom has got to be one of them.
Sergeant Sargent
Weird Wolf
Baron Von Drup
Count Dragulot
John Goldstone
Franksanwine
Blockhead
Birdman

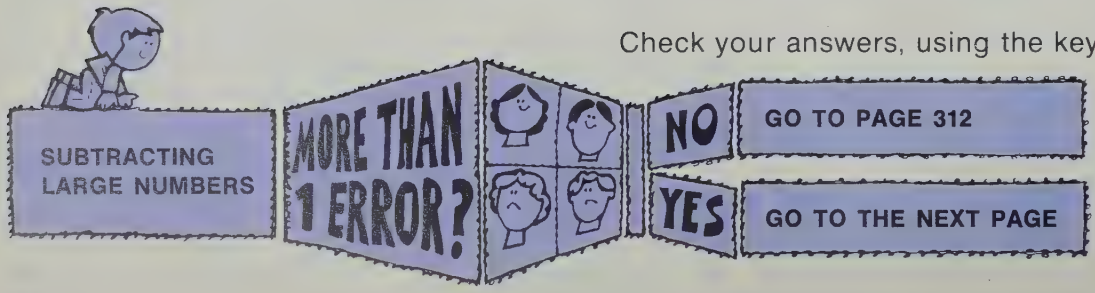


Here is a list of the amounts of money in the suspects' bank accounts on March 31 and on April 30. How much more or less is in each account on April 30 than was in it on March 31?

	Balance	
	March 31	April 30
a Baron Von Drup	$ 3 279.58	$ 3 741.82
b Birdman	$ 1 226.00	$ 1 273.55
c Blockhead	$ 182.95	$ 167.95
d Count Dragulot	$ 15 666.66	$ 17 129.79
e Franksanwine	$100 000.00	$115 000.00
f John Goldstone	$ 569.20	Account closed. Owner died
g Sergeant Sargent	$ 2 497.00	$ 1 948.27
h Weird Wolf	$ 6 931.50	$ 7 123.41

Did you eliminate one suspect from your list?

Check your answers, using the key on page 336.



Subtract

a

	tens	ones
	2	1
−		4

b

	tens	ones
	8	2
−	4	7

c

	hundreds	tens	ones
	4	5	7
−		6	8

d

	hundreds	tens	ones
	6	1	8
−	2	7	4

e

	hundreds	tens	ones
	3	7	3
−	1	9	5

Check your answers on page 336.

For each problem you missed, do the row of problems below that has the same letter. For example, if you missed **c**, do only the **c** row.

a	**1.** 22 − 6	**2.** 35 − 7	**3.** 51 − 3	**4.** 48 − 9	**5.** 92 − 8
b	**6.** 61 − 13	**7.** 70 − 26	**8.** 82 − 55	**9.** 44 − 28	**10.** 76 − 37
c	**11.** 164 − 38	**12.** 468 − 59	**13.** 813 − 67	**14.** 545 − 77	**15.** 200 − 46
d	**16.** 215 − 121	**17.** 332 − 192	**18.** 704 − 651	**19.** 828 − 372	**20.** 629 − 199
e	**21.** 522 − 256	**22.** 473 − 195	**23.** 666 − 388	**24.** 654 − 267	**25.** 227 − 149

Now turn to the next page.

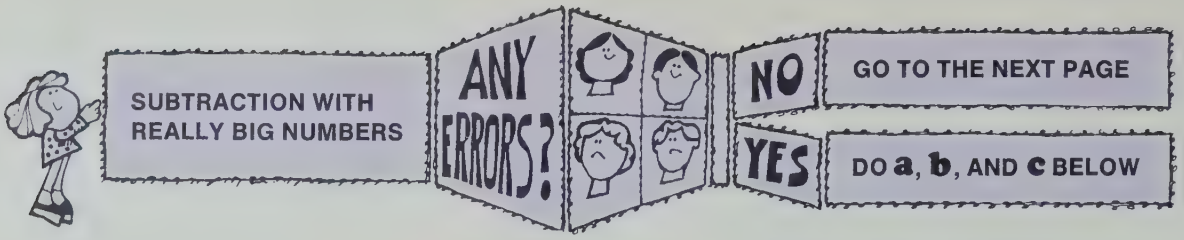
Subtract

a
$$\begin{array}{r} 567\,124 \\ -\ 73\,843 \\ \hline \end{array}$$

b
$$\begin{array}{r} 781\,546 \\ -267\,538 \\ \hline \end{array}$$

c
$$\begin{array}{r} 856\,523 \\ -396\,736 \\ \hline \end{array}$$

Check your answers using the key on page 336.



a

	thousands			ones		
	hundred	ten	one	hundreds	tens	ones
	5	9	5	3	4	
−	2	6	8	1	9	

b

	thousands			ones		
	hundred	ten	one	hundreds	tens	ones
	3	6	8	2	4	5
−		3	4	1	5	7

c

	thousands			ones		
	hundred	ten	one	hundreds	tens	ones
	7	7	4	0	0	2
−		9	2	6	8	8

Check your answers with the key on page 336.

For each problem you missed,
do the row of problems below that has the same letter.

a

1. $\begin{array}{r} 43\,671 \\ -\ 1\,847 \\ \hline \end{array}$

2. $\begin{array}{r} 182\,449 \\ -\ 28\,153 \\ \hline \end{array}$

3. $\begin{array}{r} 763\,951 \\ -\ 5\,270 \\ \hline \end{array}$

4. $\begin{array}{r} 935\,627 \\ -509\,436 \\ \hline \end{array}$

b

5. $\begin{array}{r} 758\,431 \\ -\ 25\,670 \\ \hline \end{array}$

6. $\begin{array}{r} 583\,547 \\ -124\,934 \\ \hline \end{array}$

7. $\begin{array}{r} 356\,812 \\ -167\,489 \\ \hline \end{array}$

8. $\begin{array}{r} 425\,907 \\ -\ 14\,957 \\ \hline \end{array}$

c

9. $\begin{array}{r} 247\,730 \\ -\ 38\,940 \\ \hline \end{array}$

10. $\begin{array}{r} 423\,868 \\ -115\,974 \\ \hline \end{array}$

11. $\begin{array}{r} 564\,004 \\ -125\,163 \\ \hline \end{array}$

12. $\begin{array}{r} 752\,005 \\ -231\,946 \\ \hline \end{array}$

Go to the next page if you have time.

You really should know something about your suspects. These problems will tell you a bit.

1

Weird Wolf really is weird. He collects things. He has 100 000 gum wrappers, for example. Birdman loves gum wrappers too. But he only has 83 498 of them. Weird Wolf always teases that he has more. Lots more. How many more?

2

Believe it or not, Franksanwine is 1420 years old. Count Dragulot is only 952 years old. Franksanwine always teases the count that he is only a little kid. He can't do all the things that Franksanwine can until he is as old as Franksanwine. How many years younger is the count?

3

Birdman had 249 pigeons. Then Weird Wolf "collected" 157 of them. How many pigeons did Birdman have left?

4

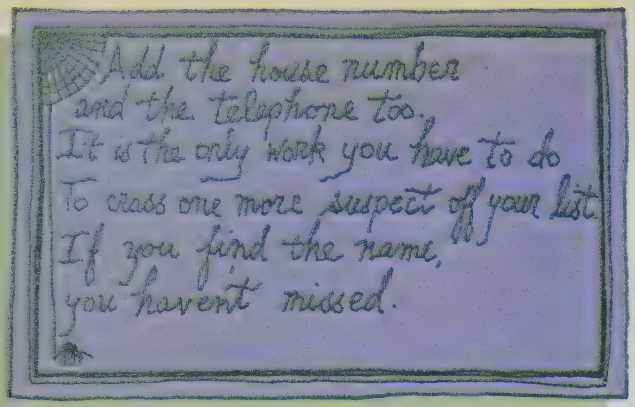
Blockhead had a water bed — a big one! He filled it with 232 647 ℓ of water. Weird Wolf "collected" 43 752 ℓ of it. How many litres were left in the bed?

5

In the past 20 years Count Dragulot has invited 72 679 people to his castle. 14 795 people have left. How many people did not leave the castle?

6

Baron Von Drup is the little old lady's favorite character. She is always snooping in his affairs. She has counted the number of letters he has received in the last ten years. She has counted 3650 pink envelopes out of the 36 500 letters he has had in his post office box. How many letters were not in pink envelopes?


Add the house number
and the telephone too.
It is the only work you have to do
To cross one more suspect off your list.
If you find the name,
you haven't missed.

Add the number of the house and the number of the telephone to decode the message. (Only one sum forms a message. The others are nonsense. That doesn't mean the other sums are wrong.)

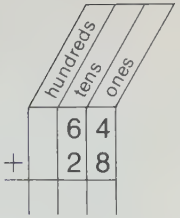
Code	
1	Baron Von Drup
2	Birdman
3	Blockhead
4	Not
5	Is
6	Phantom
7	The
8	Suspect
9	Stole
10	Jewels

Name	Address	Phone number
Birdman	654496 Tree St.	4291971
Blockhead	1993 Quarry Ave.	6657455
Dragulot, Count	34892 Coffin Rd.	2176345
Franksanwine	9289 A Street	7826187
Goldstone, John	572 Shady Rest	7843866
Sargent, Sergeant	17823 Main Ave.	9848504
Von Drup, Baron	653982 Cedar St.	9018349
Wolf, Weird	2647 Woods Court	9379783

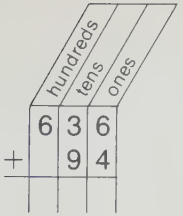
If you missed and didn't find the name, go on to the next page. If you have one less suspect, turn to page 316. Start in the middle with problem 1.

Compute.

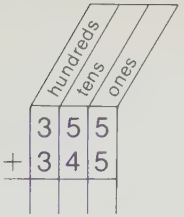
a



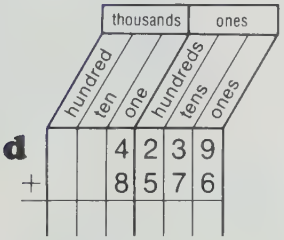
b



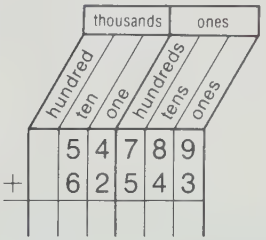
c



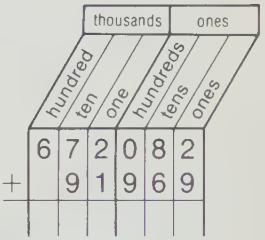
d



e



f



Use the key

on page 336 to check your answers.

For each problem you missed, do the row of problems below or on the next page that has the same letter as the problem you missed.

a

1. 61 + 83

2. 58 + 35

3. 45 + 27

4. 93 + 56

b

5. 789 + 55

6. 538 + 63

7. 842 + 78

8. 666 + 99

c

9. 543 + 618

10. 739 + 287

11. 398 + 575

12. 598 + 752

d

13. 1268 + 1376

14. 6124 + 958

15. 2368 + 6499

16. 3573 + 3599

e

17. 83 451 + 7 808

18. 77 799 + 62 166

19. 59 816 + 87 452

20. 63 543 + 50 507

f

21. 582 084 + 893 295

22. 739 387 + 227 071

23. 236 806 + 80 759

24. 789 028 + 154 674

Solve these problems and you'll know still more about your suspects.

1

Count Dragulot has an Egyptian mummy. He bought it for $29 350. He thought it must be lonesome all by itself, so he bought another for $789 122. How much money in all does he have wrapped up in his mummies?

2

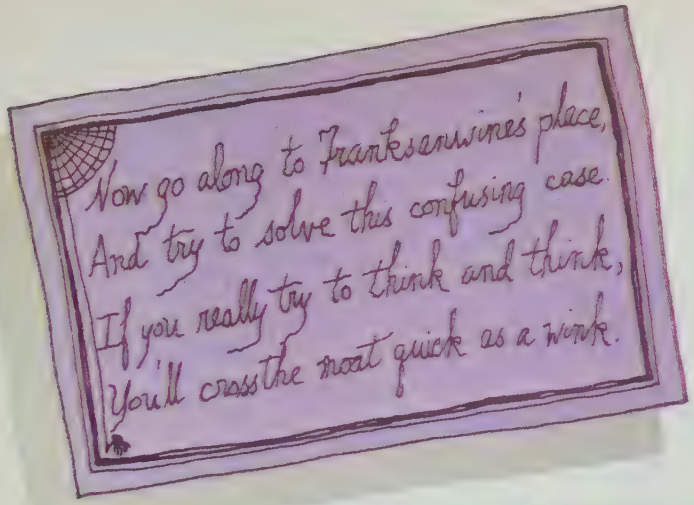
Weird Wolf has lots of money too. He counts it each month when the moon is full. Last month he counted $482 769. This month he added $180 962 to his money. How much money will he count when the moon is full this month? (Where could that money have come from?)

3

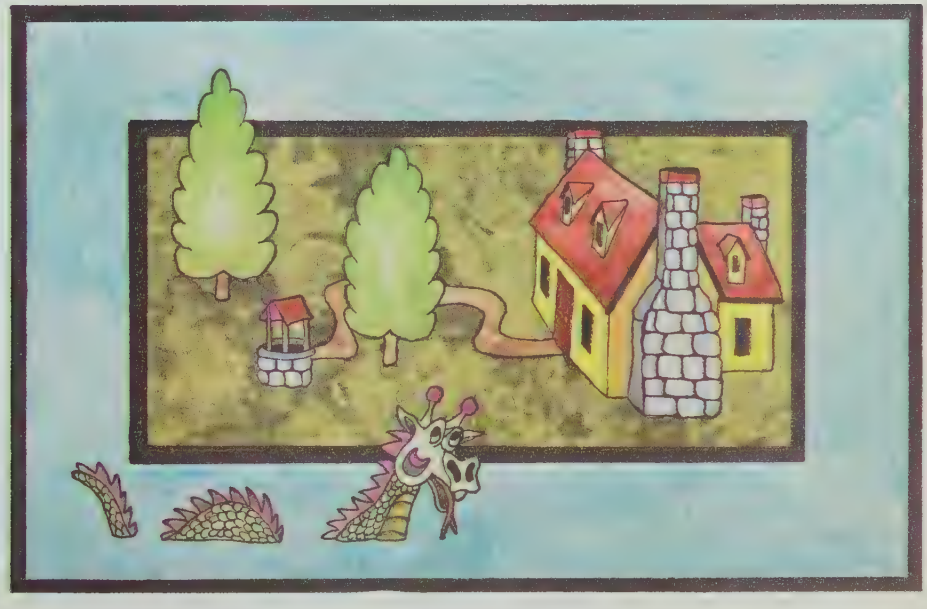
The old lady is the only one who knows who the Phantom is. She has watched him for a long time. She knows he used many different names. He used 1109 names last year. And he used 901 different names this year. How many different names has he used all together?

4

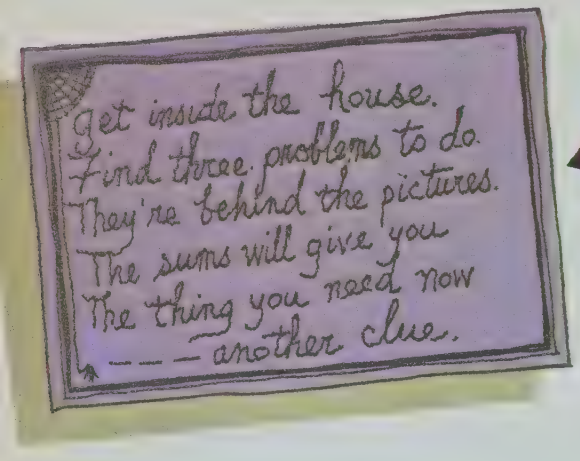
You've had enough practice now to be able to correct your mistakes on page 314. Then decode the message on that page and eliminate one suspect.
After that, go to page 317.

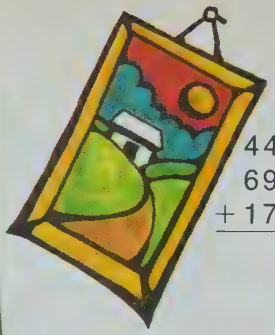

Now go along to Franksenwines place,
And try to solve this confusing case.
If you really try to think and think,
You'll cross the moat quick as a wink.

The picture shows the house taken from the air. The moat goes all around the property. There is no bridge across. The water is 10 m wide and very cold. You don't know what might be in the water, either. You can't swim across. You find 2 boards. One board is 9 m long. The other board is just under 9.95 m long. You don't have a hammer and nails. Can you use the boards to cross the moat? Tell how.



You're given a message to go to Franksanwine's house.


Get inside the house.
Find three problems to do.
They're behind the pictures.
The sums will give you
The thing you need now
---another clue.



$$\begin{array}{r} 443 \\ 699 \\ +\ 173 \\ \hline \end{array}$$

$$\begin{array}{r} 5265 \\ 1283 \\ +\ 3767 \\ \hline \end{array}$$

$$\begin{array}{r} 186 \\ 340 \\ 186 \\ +\ 603 \\ \hline \end{array}$$

Check your answers with the key on page 336. If you made an error, go to page 319 for another clue. If you didn't make any mistakes, you have just found the combination to Franksanwine's safe.
Use the sum in problem 3 to open the safe.

DIRECTIONS FOR OPENING THE SAFE

1. Start at zero.
2. Turn forward to the number in the thousands place.
3. Turn back to the number in the hundreds place.
4. Turn forward to the number in the tens place.
5. Turn back to the number in the ones place.

The number you stopped on tells the number you'll start on on page 319.

1.
$$\begin{array}{r} 6 \\ 7 \\ 1 \\ +3 \\ \hline \end{array}$$

2.
$$\begin{array}{r} 3 \\ 5 \\ 9 \\ +6 \\ \hline \end{array}$$

3.
$$\begin{array}{r} 6 \\ 4 \\ 21 \\ +47 \\ \hline \end{array}$$

4.
$$\begin{array}{r} 17 \\ 25 \\ 46 \\ +20 \\ \hline \end{array}$$

5.
$$\begin{array}{r} 22 \\ 20 \\ 32 \\ +42 \\ \hline \end{array}$$

6.
$$\begin{array}{r} 532 \\ 638 \\ 57 \\ +\ 72 \\ \hline \end{array}$$

7.
$$\begin{array}{r} 674 \\ 140 \\ 685 \\ +781 \\ \hline \end{array}$$

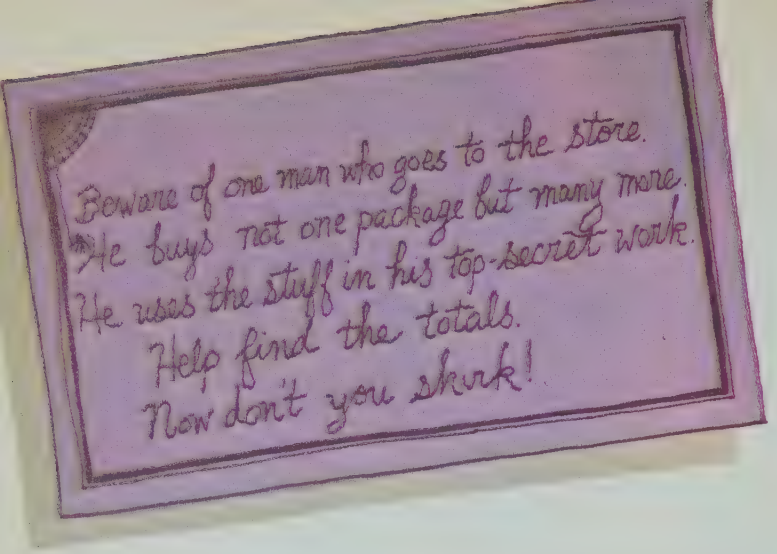
8.
$$\begin{array}{r} 5293 \\ 7250 \\ +7324 \\ \hline \end{array}$$

9. Check your answers with the key on page 336. Make sure your answers are correct. Take only the digits in the ones place in the sums for problems 5, 6, 7, and 8. Add them. Use that sum. Match it with the list of suspects. The number that matches is the next suspect you can cross off the list.

21—Count Dragulot	23—Weird Wolf
22—Sergeant Sargent	24—Baron Von Drup

NOW EVERYBODY FIND THE ANSWER TO THIS ONE.

10. Count Dragulot is adding bats to his batroom. He bought 439 bats from Louie's Bat and Ball Store, 291 from Bill's Bat and Owl Shop, 5503 bats from Creature Supplies Company, and 1306 used bats from Honest John's Used Bats. How many bats did he buy in all?


Beware of one man who goes to the store.
He buys not one package but many more.
He uses the stuff in his top-secret work.
Help find the totals.
Now don't you shirk!

1. He bought 7 jars that contained 34 each. How many in all?
2. He bought 9 bags that had 376 in each bag. How many in all?
3. He bought 64 boxes that had 82 in each. How many in all?
4. And 76 packs that had 387 in each. How many in all?
5. Then he bought 61 cartons with 583 in each carton. How many in all?

Take the digit in the tens place in each product. List them in order. Use each digit in order to break the code listed below. You'll know one more suspect to cross off your list.

CODE

0	1	2	3	4	5	6	7	8	9
T	A	WE	HI	M	DR	N	VO	RD	LF

If you got the message, go on to page 322. If you don't have the name to cross off your list, go to the next page for another chance.

You can use either of these methods to complete your multiplication.

METHOD 1

```
  78
×13
 24      3 × 8
210      3 × 70
 80     10 × 8
700     10 × 70
  ?
```

METHOD 2

```
  78
×13
234      3 × 78
780     10 × 78
  ?
```

a $\begin{array}{r} 453 \\ \times\ 6 \\ \hline \end{array}$ **b** $\begin{array}{r} 45 \\ \times 78 \\ \hline \end{array}$ **c** $\begin{array}{r} 895 \\ \times\ 39 \\ \hline \end{array}$

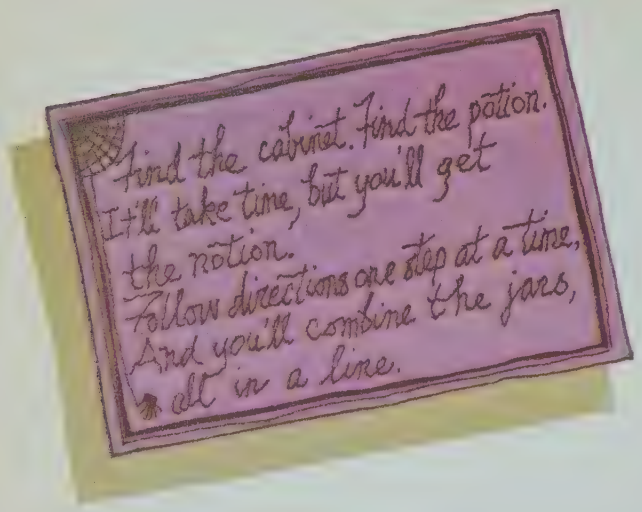
Use the key on page 336 to check your answers.
For each problem you missed, do the lettered row of problems that is the same as the letter of the problem you missed.

a **1.** $\begin{array}{r} 28 \\ \times\ 4 \\ \hline \end{array}$ **2.** $\begin{array}{r} 43 \\ \times\ 7 \\ \hline \end{array}$ **3.** $\begin{array}{r} 287 \\ \times\ 5 \\ \hline \end{array}$ **4.** $\begin{array}{r} 751 \\ \times\ 2 \\ \hline \end{array}$

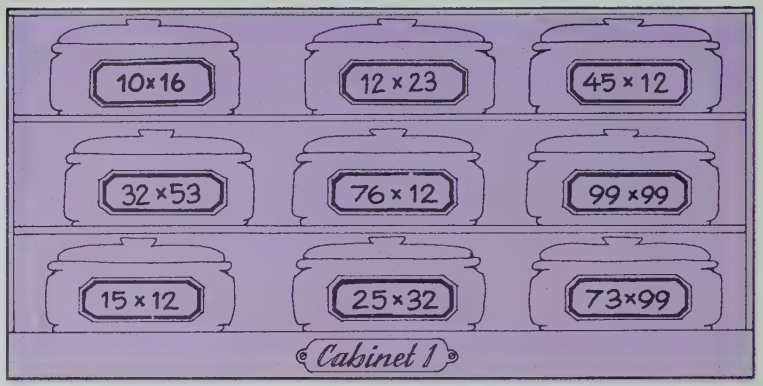
b **5.** $\begin{array}{r} 39 \\ \times 50 \\ \hline \end{array}$ **6.** $\begin{array}{r} 65 \\ \times 27 \\ \hline \end{array}$ **7.** $\begin{array}{r} 26 \\ \times 35 \\ \hline \end{array}$ **8.** $\begin{array}{r} 67 \\ \times 19 \\ \hline \end{array}$

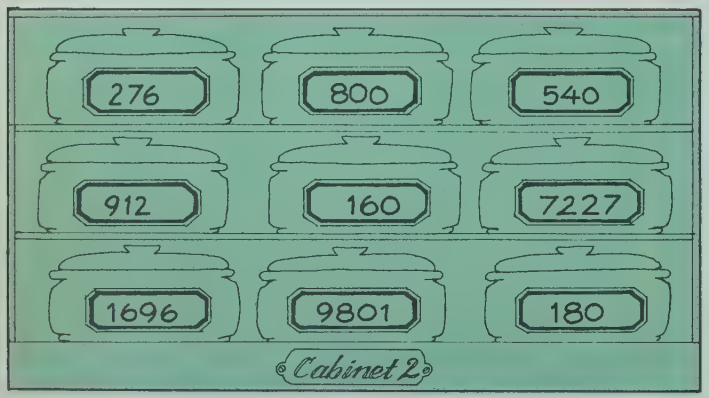
c **9.** $\begin{array}{r} 484 \\ \times\ 12 \\ \hline \end{array}$ **10.** $\begin{array}{r} 349 \\ \times\ 23 \\ \hline \end{array}$ **11.** $\begin{array}{r} 758 \\ \times\ 75 \\ \hline \end{array}$ **12.** $\begin{array}{r} 686 \\ \times\ 56 \\ \hline \end{array}$

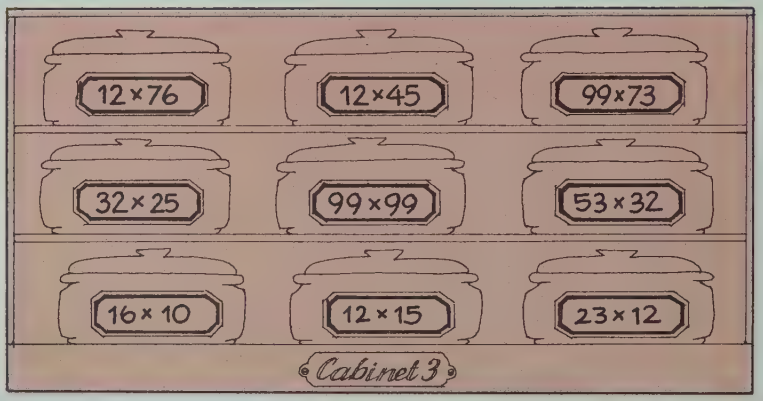
Use the digits in problem 12 to break the code on page 320.


Find the cabinet. Find the potion.
It'll take time, but you'll get
the notion.
Follow directions one step at a time,
And you'll combine the jars,
all in a line.

Cabinets 1, 2, and 3 each have 9 jars of potion. 27 jars in all. Each jar is marked differently. But there is one jar in cabinet 1 that is like a jar in cabinet 2. And you'll find still another jar just like your first and second ones in cabinet 3.

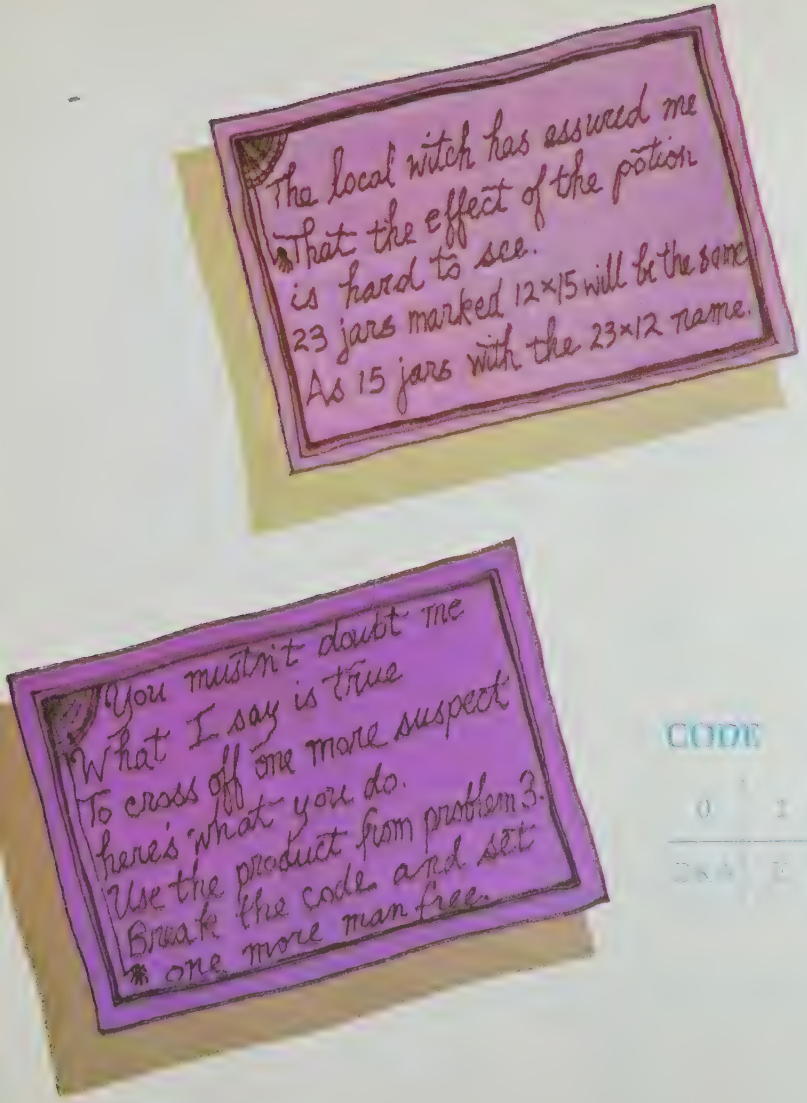






Find the jars with the same potion.
Write your answers like this:

Cabinet 1	Cabinet 2	Cabinet 3
10×16	160	16×10

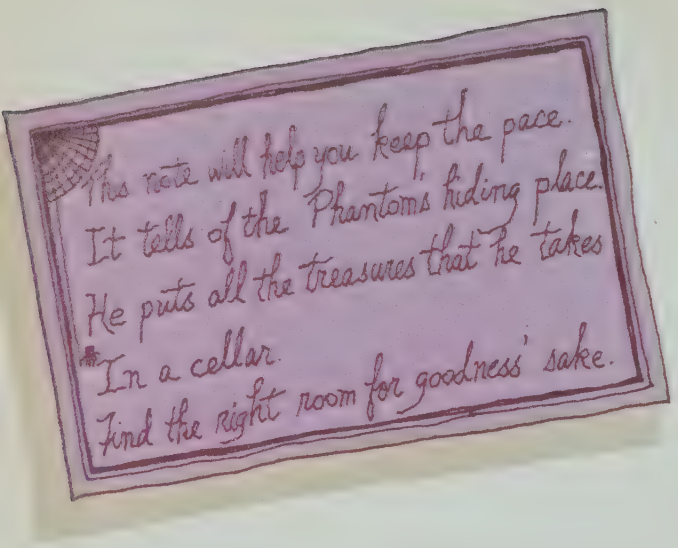

The local witch has assured me
That the effect of the potion
is hard to see.
23 jars marked 12×15 will be the same
As 15 jars with the 23×12 name.
You mustn't doubt me
What I say is true
To cross off one more suspect
Here's what you do.
Use the product from problem 3.
Break the code and set
one more man free.

Can the little old lady be right? Multiply to prove whether she is right or wrong.

1. 25 jars of 32×53 should be the same as 53 jars of $\underline{?} \times \underline{?}$. Multiply to show that it's true.
2. 45 jars of 12×76 should be the same as 76 jars of $\underline{?} \times \underline{?}$. Multiply to show that it's true.
3. 73 jars of 99×99 should be the same as 99 jars of $\underline{?} \times \underline{?}$. Multiply to show that it's true.

CODE

0	1	2	3	4	5	6	7	8	9


This note will help you keep the pace.
It tells of the Phantoms hiding place.
He puts all the treasures that he takes
In a cellar.
Find the right room for goodness' sake.

Before you can check out the cellar, you must do these problems. Divide.

1. $3\overline{)75}$ **2.** $6\overline{)846}$ **3.** $4\overline{)7816}$

4. $8\overline{)9152}$ **5.** $9\overline{)1350}$

Below is a picture of the cellar. Each room has doorways. Each room has a number. Some of them just happen to have the same number as the answers to the problems you just worked. Find the room marked with the same number as your first answer.

Use tracing paper.

Trace the path from that room to the next room that has the same number as your second answer. Move in order of your answers. If you can't find a room that is the same number as one of your answers, complete the next page.

You have found the right clue if your path forms the shape of a letter of the alphabet. Take your clue to page 326.

O.K., so you had some trouble. Show that it wasn't big trouble. *Complete* each problem below. Be sure to write the remainder beside the quotient (if there is a remainder).

a

```
   ?
4)213
 200   (50 × 4)
  13
  12   (3 × 4)
   ?
```

b

```
   ?
7)854
 700   (100 × 7)
 154
 140   (20 × 7)
   ?
```

c

```
   ?
6)4121
3600   (600 × 6)
   ?
```

Check your answers with the key on page 336. For each problem you missed, do the row of problems below with the same letter as the problem you missed.

a **1.** $3\overline{)125}$ **2.** $6\overline{)159}$ **3.** $5\overline{)476}$ **4.** $4\overline{)307}$

b **5.** $4\overline{)840}$ **6.** $7\overline{)815}$ **7.** $5\overline{)705}$ **8.** $8\overline{)914}$

c **9.** $5\overline{)5648}$ **10.** $3\overline{)9176}$ **11.** $8\overline{)2364}$ **12.** $7\overline{)6983}$

Go back to page 324 and get back on the right path.

NOW ANSWER THIS ONE.

13. Everyone wondered how many Venus's-flytrap plants Count Dragulot owned. The little old lady kept track of the number of flies the count caught. She knew each plant needs 8 flies each day. The count caught 152 flies today. How many Venus's-flytrap plants must the count own?

Pick the directions that have the same letter you found.

a

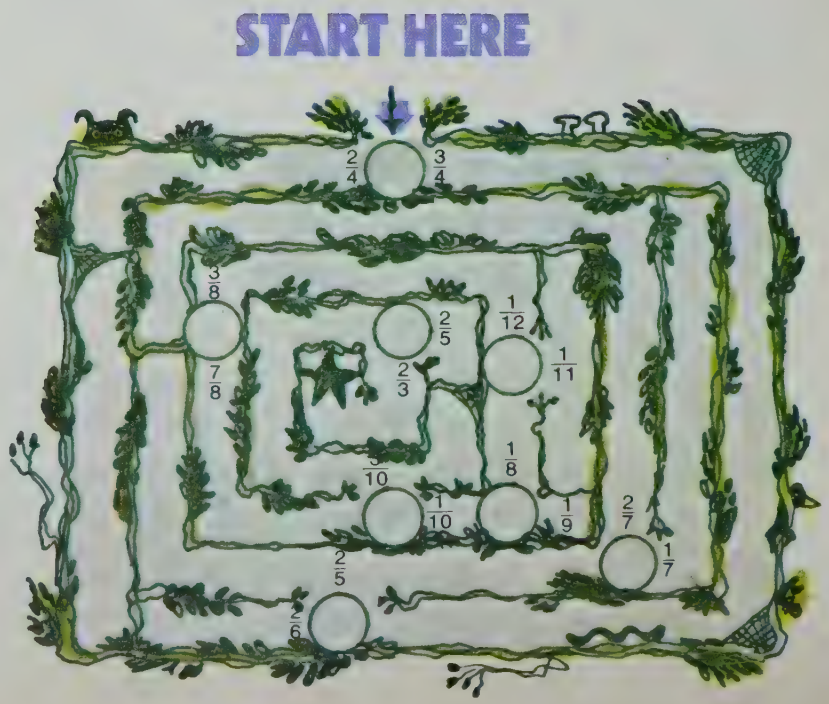
You must have been working very hard. You must be tired. Because you are tired, you made a wrong turn. In fact, you're reading the wrong directions. Go back to page 324 and get back on the right path.

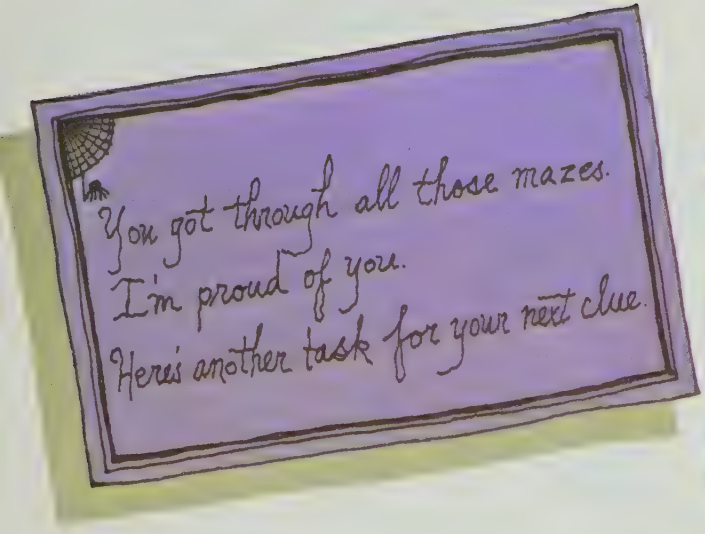
b

The lights in the cellar are very dim. Your eyes played a trick on you. You have lost your way. You are reading the wrong directions. Go back to page 324 and get back on the right path.

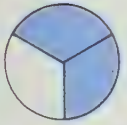
c

You must find your way to the center of the maze below. At each circle you must decide which way to go. Go in the direction of the larger fraction. Keep track of all your turns. Get a sheet of paper. Write the largest fraction at each turn.





Your list of fractions will help decode the next message. The fractional part is shown as a region. Find the region that shows the first fraction on your list. If you continue, you'll find the name of one more suspect to cross off your list.

 jewels

Baron Von Drup

is

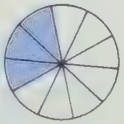
Count Dragulot

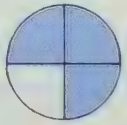
steal

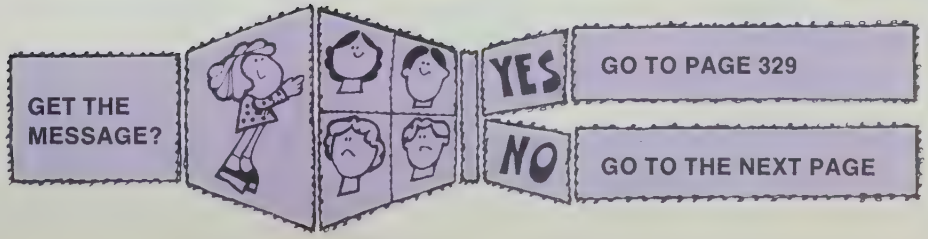
not

not

did

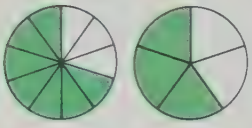
 the

 Franksanwine

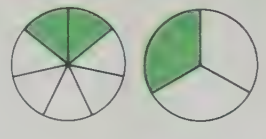


Complete each of these statements with $>$ or $<$.

a $\frac{7}{10} \text{ ? } \frac{3}{5}$



b $\frac{2}{7} \text{ ? } \frac{1}{3}$



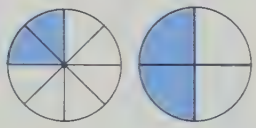
c $\frac{3}{5} \text{ ? } \frac{4}{7}$

Need a model this time? Draw your own.

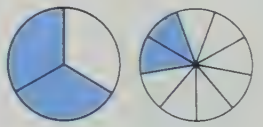
Use the key on page 336 to check your answers. For each problem you missed, do the row of problems below with the same letter as the problem you missed.

a

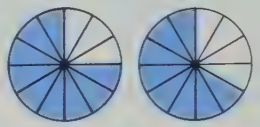
1. $\frac{2}{8} \text{ ? } \frac{2}{4}$



2. $\frac{2}{3} \text{ ? } \frac{2}{9}$

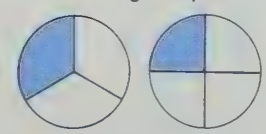


3. $\frac{9}{12} \text{ ? } \frac{8}{12}$



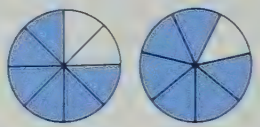
b

4. $\frac{1}{3} \text{ ? } \frac{1}{4}$



5. $\frac{3}{8} \text{ ? } \frac{1}{4}$

6. $\frac{6}{8} \text{ ? } \frac{6}{7}$



c If you need a model for any of these problems, draw your own.

7. $\frac{5}{6} \text{ ? } \frac{1}{6}$
8. $\frac{5}{8} \text{ ? } \frac{3}{8}$
9. $\frac{2}{2} \text{ ? } \frac{1}{2}$
10. $\frac{3}{4} \text{ ? } \frac{3}{5}$
11. $\frac{2}{7} \text{ ? } \frac{2}{5}$
12. $\frac{5}{7} \text{ ? } \frac{5}{4}$
13. $\frac{3}{2} \text{ ? } \frac{2}{2}$
14. $\frac{1}{8} \text{ ? } \frac{1}{2}$
15. $\frac{1}{2} \text{ ? } \frac{3}{4}$

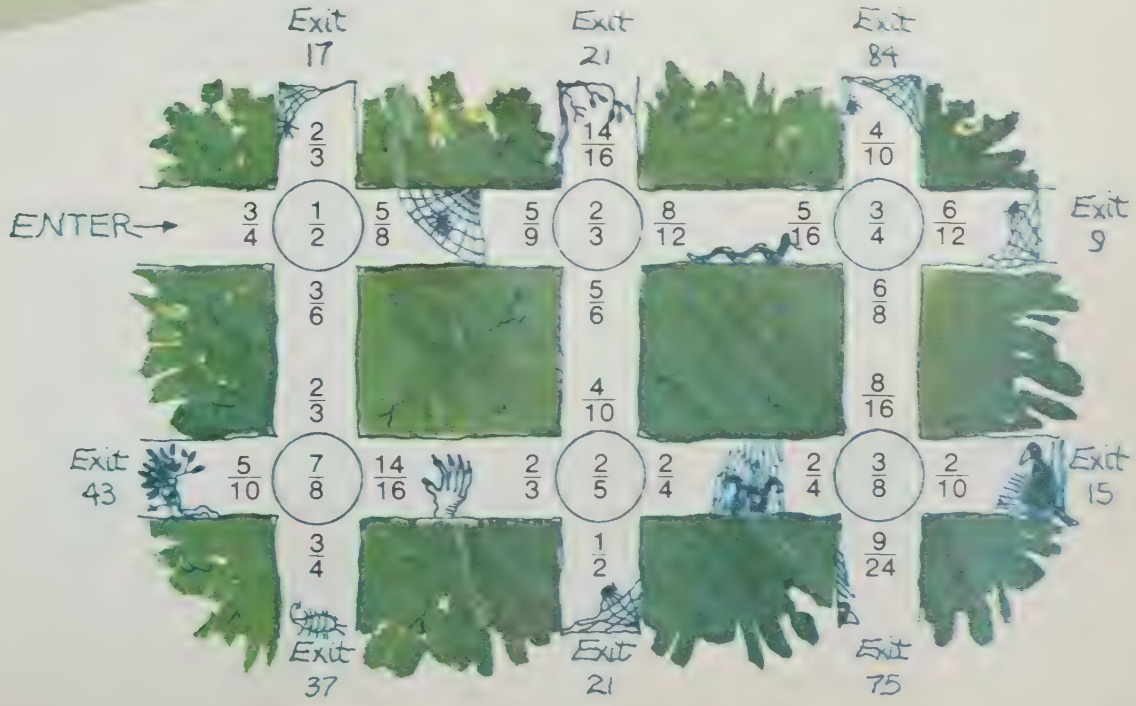
You've practised enough now to be able to correct your mistakes on page 327. Then you'll eliminate one more suspect. After that go to page 329.

Look down. Aha!
There's an opening into the ground.
One more clue is about to be found.
Walk through the tunnels and there will be
An exit sign for you to see.

Once again you have to decide which paths to follow.
At each crossing you will see a fraction in a ring.
Find another name for the fraction.

Go in that direction.

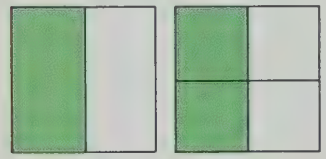
If you take the wrong path, scorpions may bite you.
Take your exit number and go to the next page.



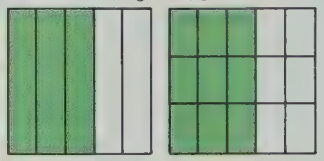
If your exit number was 75, go to the next page now.
If your exit number was *not* 75, you have to have time to recover from those scorpion bites. Do this page.

Complete each of these sentences.

a $\frac{1}{2} = \frac{\blacksquare}{4}$



b $\frac{3}{5} = \frac{\blacksquare}{15}$

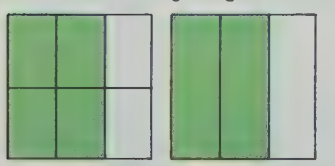


c $\frac{3}{4} = \frac{\blacksquare}{16}$

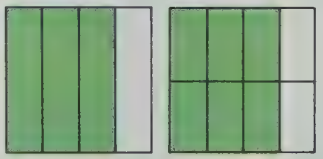
Need a model again? Draw your own.

Use the key on page 336 to check your answers. For each problem you missed, do the row of problems below with the same letter as the problem you missed.

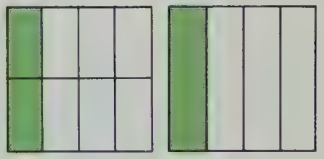
a **1.** $\frac{4}{6} = \frac{\blacksquare}{3}$



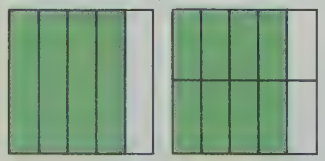
2. $\frac{3}{4} = \frac{\blacksquare}{8}$



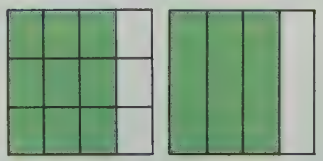
3. $\frac{2}{8} = \frac{\blacksquare}{4}$



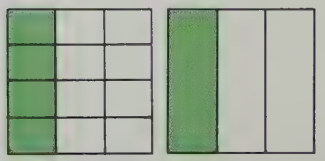
b **4.** $\frac{4}{5} = \frac{\blacksquare}{10}$



5. $\frac{9}{12} = \frac{\blacksquare}{4}$



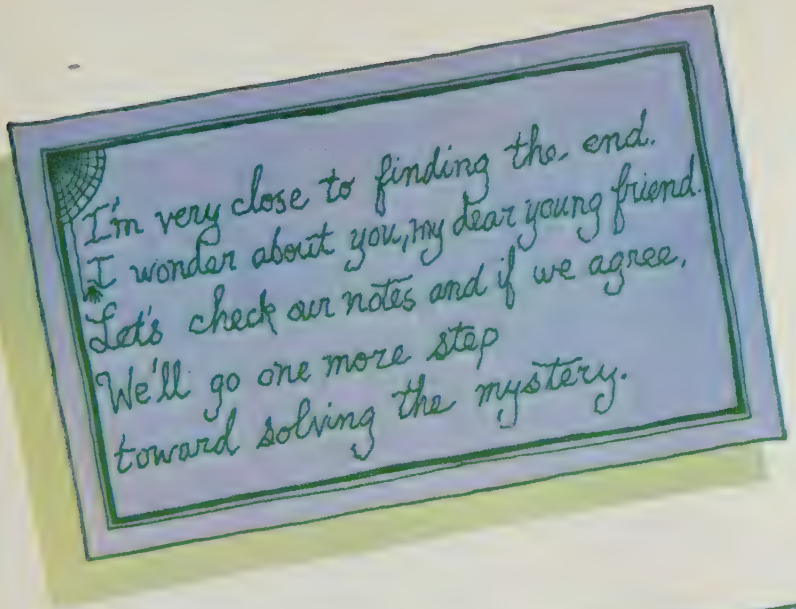
6. $\frac{4}{12} = \frac{\blacksquare}{3}$



c Draw your own models if you need them.

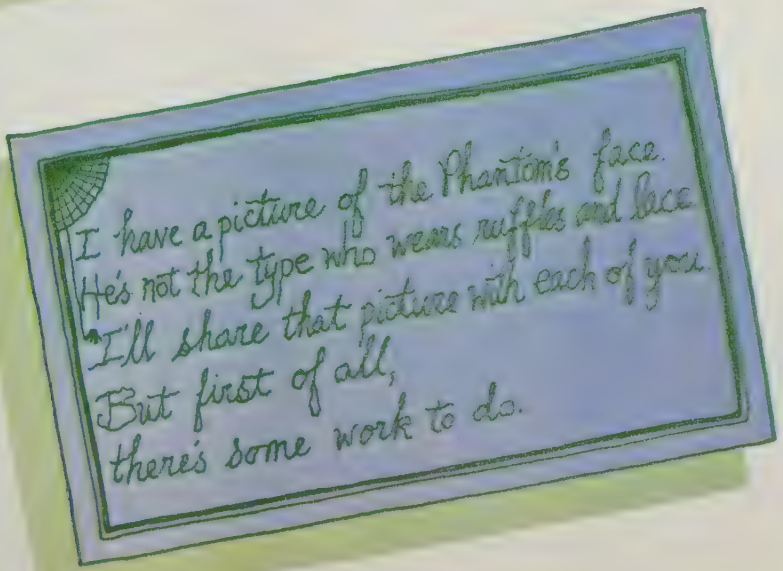
7. $\frac{2}{5} = \frac{\blacksquare}{10}$ **8.** $\frac{6}{9} = \frac{\blacksquare}{3}$ **9.** $\frac{5}{10} = \frac{\blacksquare}{2}$ **10.** $\frac{4}{6} = \frac{\blacksquare}{9}$ **11.** $\frac{10}{14} = \frac{\blacksquare}{7}$ **12.** $\frac{2}{12} = \frac{\blacksquare}{18}$

Exit 75 has led to another note from the little old lady.


I'm very close to finding the end.
I wonder about you, my dear young friend.
Let's check our notes and if we agree,
We'll go one more step
toward solving the mystery.

1. One suspect is no longer alive.
2. One suspect was eliminated on page 314.
3. One man less on the list after page 319.
4. Another was crossed off the list on page 320 or page 321.
5. Still another was freed on page 323.
6. And one more suspect was eliminated on page 327.

There are only two suspects left. Who are they?


I have a picture of the Phantom's face.
He's not the type who wears ruffles and lace.
I'll share that picture with each of you.
But first of all,
there's some work to do.

To get the picture of the Phantom in focus, complete the problems in set 1. Write the simplest name for each fraction.

1. $\frac{2}{6}$	2. $\frac{6}{8}$	3. $\frac{5}{10}$	4. $\frac{4}{10}$	5. $\frac{3}{12}$
6. $\frac{8}{18}$	7. $\frac{10}{12}$	8. $\frac{6}{20}$	9. $\frac{0}{3}$	10. $\frac{6}{18}$
11. $\frac{6}{16}$	12. $\frac{2}{10}$	13. $\frac{7}{7}$	14. $\frac{8}{12}$	15. $\frac{10}{16}$
16. $\frac{20}{25}$	17. $\frac{2}{20}$	18. $\frac{6}{15}$	19. $\frac{3}{18}$	20. $\frac{6}{10}$

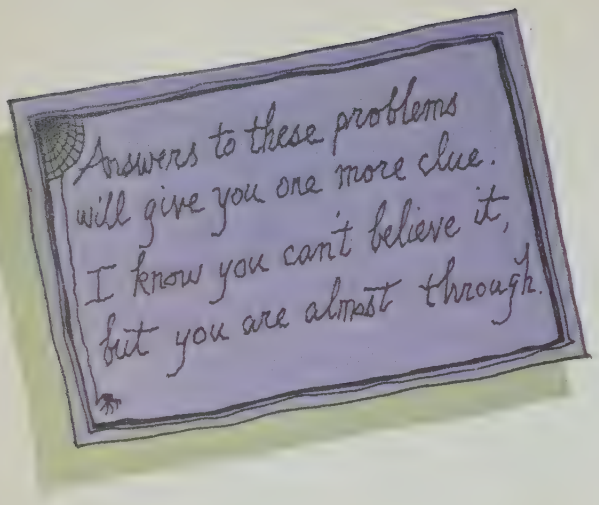
You'll need answers from set 2 also. Write a mixed number for each of these.

1. $\frac{5}{4}$	2. $\frac{8}{5}$	3. $\frac{11}{8}$	4. $\frac{4}{3}$
5. $\frac{13}{5}$	6. $\frac{17}{6}$	7. $\frac{10}{3}$	8. $\frac{7}{2}$
9. $\frac{14}{9}$	10. $\frac{11}{4}$	11. $\frac{17}{10}$	12. $\frac{11}{6}$
13. $\frac{6}{4}$	14. $\frac{14}{8}$	15. $\frac{24}{9}$	16. $\frac{22}{10}$

Place a plain sheet of paper over this page. Trace the blue dots first. If your paper slips, the blue dots will help you get your paper in the right place again.

The answers for set 1 are next to blue dots. Find the number to the right of a dot that matches your first answer. Start there. Draw a line from that dot to the dot that has the same number as your problem 2. Continue in order. These lines will show you part of the Phantom's face.

The answers for set 2 are next to the red dots. Find the number to the right of a red dot that matches your first answer. Connect the dots in order.



Add. Write the answers in the order in which they occur. Then decode.

1. $\frac{4}{5}+\frac{1}{5}$
2. $\frac{3}{8}+\frac{2}{8}$
3. $\frac{1}{4}+\frac{1}{4}$
4. $\frac{2}{10}+\frac{1}{10}$
5. $\frac{10}{15}+\frac{3}{15}$
6. $\frac{2}{8}+\frac{3}{8}$
7. $\frac{1}{15}+\frac{6}{15}$
8. $\frac{20}{100}+\frac{1}{100}$
9. $\frac{3}{5}+\frac{2}{5}$
10. $\frac{1}{9}+\frac{3}{9}$
11. $\frac{4}{8}+\frac{2}{8}$
12. $\frac{2}{10}+\frac{1}{10}$
13. $\frac{7}{12}+\frac{8}{12}$
14. $\frac{4}{12}+\frac{1}{12}$
15. $\frac{1}{10}+\frac{2}{10}$
16. $\frac{5}{100}+\frac{16}{100}$
17. $\frac{3}{9}+\frac{1}{9}$
18. $\frac{2}{5}+\frac{3}{5}$
19. $\frac{1}{10}+\frac{2}{10}$

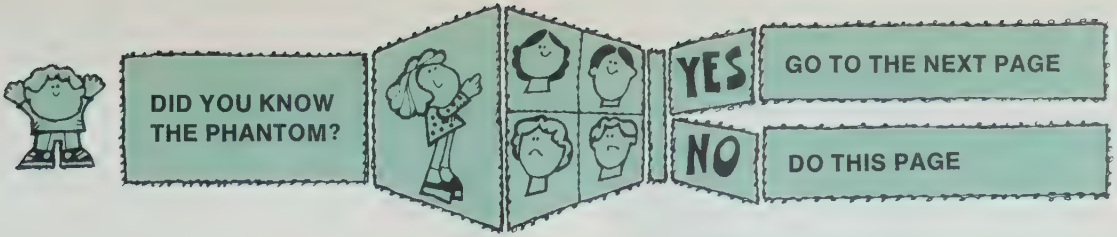
Subtract.

1. $\frac{15}{15}-\frac{2}{15}$
2. $\frac{7}{12}-\frac{5}{12}$
3. $\frac{5}{9}-\frac{2}{9}$
4. $\frac{6}{9}-\frac{1}{9}$
5. $\frac{4}{10}-\frac{1}{10}$
6. $\frac{90}{100}-\frac{69}{100}$
7. $\frac{6}{9}-\frac{2}{9}$
8. $\frac{3}{8}-\frac{2}{8}$
9. $\frac{8}{10}-\frac{5}{10}$
10. $\frac{80}{100}-\frac{59}{100}$
11. $\frac{7}{9}-\frac{3}{9}$
12. $\frac{6}{9}-\frac{3}{9}$
13. $\frac{12}{15}-\frac{5}{15}$
14. $\frac{4}{4}-\frac{1}{4}$

CODE (Careful! There's a trick in the message.)

A	B	D	E	H	I	M	N	O	P	R	S	T	U	V	Space
$\frac{7}{15}$	$\frac{3}{4}$	$\frac{5}{9}$	$\frac{2}{4}$	$\frac{5}{8}$	$\frac{15}{12}$	$\frac{6}{8}$	$\frac{21}{100}$	$\frac{4}{9}$	$\frac{13}{15}$	$\frac{3}{9}$	$\frac{5}{12}$	$\frac{5}{5}$	$\frac{2}{12}$	$\frac{1}{8}$	$\frac{3}{10}$

Who is the Phantom? Go to the next page.



Find the answer to each of these problems.

a $\frac{2}{9}+\frac{5}{9}$ **b** $\frac{6}{12}-\frac{2}{12}$

Use the key on page 336 to check your answers. For each problem you did incorrectly, do the set of problems below with the same letter as the problem you missed.

a Add.

1. $\frac{2}{4}+\frac{1}{4}$	**2.** $\frac{1}{6}+\frac{3}{6}$	**3.** $\frac{4}{6}+\frac{1}{6}$	**4.** $\frac{4}{8}+\frac{3}{8}$	**5.** $\frac{3}{10}+\frac{6}{10}$
6. $\frac{3}{9}+\frac{2}{9}$	**7.** $\frac{5}{12}+\frac{2}{12}$	**8.** $\frac{6}{12}+\frac{5}{12}$	**9.** $\frac{5}{14}+\frac{7}{14}$	**10.** $\frac{7}{16}+\frac{5}{16}$

b Subtract.

11. $\frac{5}{6}-\frac{2}{6}$	**12.** $\frac{5}{9}-\frac{3}{9}$	**13.** $\frac{3}{4}-\frac{2}{4}$	**14.** $\frac{7}{12}-\frac{4}{12}$	**15.** $\frac{7}{12}-\frac{3}{12}$
16. $\frac{7}{8}-\frac{6}{8}$	**17.** $\frac{7}{10}-\frac{2}{10}$	**18.** $\frac{11}{12}-\frac{6}{12}$	**19.** $\frac{11}{12}-\frac{9}{12}$	**20.** $\frac{14}{15}-\frac{9}{15}$

Now that you've had more practice, you should be able to correct your errors on page 334. Then you'll know who the Phantom is. After that, go to page 336.

Answer Key

page

310 **a** $462.24 **b** $47.55 **c** $15.00
d $1463.13 **e** $15 000.00 **f** account closed
g $548.73 **h** $191.91

311 **a** 17 **b** 35 **c** 389 **d** 344 **e** 178

312 top: **a** 493 281 **b** 514 008
c 459 787
bottom: **a** 32 715 **b** 334 088
c 681 314

315 **a** 92 **b** 730 **c** 700
d 12 815 **e** 117 332 **f** 764 051

318 **1.** 1315 **2.** 10 315 **3.** 1315

319 **1.** 17 **2.** 23 **3.** 78 **4.** 108
5. 116 **6.** 1299 **7.** 2280 **8.** 19 867

321 **a** 2718 **b** 3510 **c** 34 905

325 **a** 53 R1 **b** 122 **c** 686 R5

328 **a** $\frac{7}{10} > \frac{3}{5}$ **b** $\frac{2}{7} < \frac{1}{3}$ **c** $\frac{3}{5} > \frac{4}{7}$

330 **a** $\frac{1}{2} = \frac{2}{4}$ **b** $\frac{3}{5} = \frac{9}{15}$ **c** $\frac{3}{4} = \frac{12}{16}$

335 **a** $\frac{7}{9}$ **b** $\frac{4}{12}$ or $\frac{1}{3}$

Some more interesting information about the 7 unfriendly people who lived in the tiny mountain town:

1. During an especially difficult operation, Franksanwine took 42 jolts of electricity each hour for 13 hours. How many jolts in all did he take?

2. Count Dragulot's mummy kept getting lost in the count's huge house. The count had to go look for his mummy 9999 times the first year, 6752 times the next year, and 728 times the last year. How many times did he have to go look for his mummy before he bought his bloodhound to do the job for him?

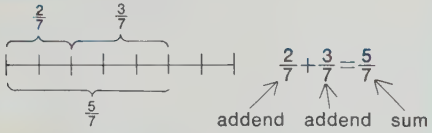
3. Birdman ate a very special diet. In the past month (31 days) he ate 26 bags of birdseed each day, 17 baskets of berries each day, and 12 boxes of Brady's Birdy Biscuits each day. How many bags of birdseed, how many baskets of berries, and how many boxes of Brady's Birdy Biscuits did he eat in all?

4. Blockhead joined the circus once. He was shot out of a cannon 9 times a day. He quit after he had been shot 774 times. Enough is enough! How many days did he work?

5. Weird Wolf's favorite store had a sale on wolfsbane. If you buy 125 packages you get a FREE silver bullet. Each package contained 23 grams of wolfsbane. How many grams of wolfsbane did Weird Wolf buy to get his free silver bullet?

GLOSSARY

addition Putting together



congruent Two figures that are the same size and shape are congruent. Trace and match to test.

congruent triangles

decimal Another name for some fractions

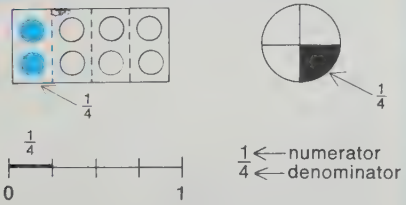
division quotient → 91 R2 ← remainder

fact: $45 \div 5 = 9$

problem:

$$\begin{array}{r} 90 \\ 5\overline{)457} \\ -\,450 \quad (90 \times 5) \\ \hline 7 \\ -\,5 \quad (1 \times 5) \\ \hline 2 \end{array}$$

fraction A number that tells how much



$\frac{1}{2} = \frac{1 \times 3}{2 \times 3} = \frac{3}{6}$. $\frac{1}{2}$ can be renamed as $\frac{3}{6}$.

$\frac{3}{6} = \frac{3 \div 3}{6 \div 3} = \frac{1}{2}$. $\frac{1}{2}$ is the simplest name for $\frac{3}{6}$

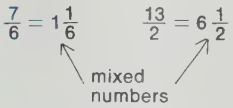
greatest common factor

factors of 12: 1, 2, 3, ④, 6, 12
factors of 16: 1, 2, ④, 8, 16
4 is the greatest common factor of 12 and 16.

math sentence

true: $3 + 4 = 7$ missing factor: $3 \times \square = 18$
false: $4 \times 2 > 10$ equality: $14 - 6 = 8$
open: $3 + \square = 6$ inequality: $14 + 2 < 20$

mixed number Another name for some fractions



multiple Another name for product

The multiples of 5 are 0, 5, 10, 15, 20, and so on because $0 \times 5 = 0$, $1 \times 5 = 5$, $2 \times 5 = 10$, and so on.

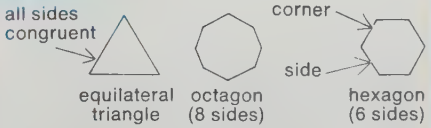
multiplication

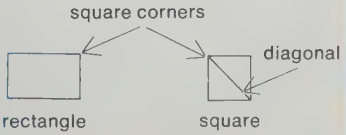
$$\begin{array}{rl} 24 & \text{factor} \\ \times\ 6 & \text{factor} \\ \hline 24 & (6 \times 4) \\ +\,120 & (6 \times 20) \\ \hline 144 & \text{product} \end{array}$$

operation Using a pair of numbers to get another number

addition	subtraction
+ (plus)	− (minus)
multiplication	**division**
× (times)	÷ (divided by)

plane figure





prediction A guess of what will happen after doing good thinking and research

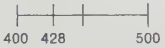
prism A special solid shape

relation symbol $=, \neq, >, <$

$4 = 4$ — 4 equals 4
$6 \neq 3$ — 6 is not equal to 3
$8 > 2$ — 8 is greater than 2
$1 < 5$ — 1 is less than 5

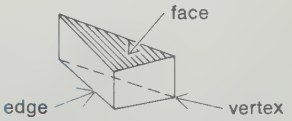
rounding

37 rounded to the nearest ten is 40.
37 is rounded up to 40.

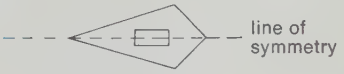


428 rounded to the nearest hundred is 400.
428 is rounded down to 400.

solid shape



symmetry plane figure can be folded on a line to match exactly.



tally A way of recording a count

23 𝍸 𝍸 𝍸 ||| ← tally marks

INDEX

addition
applications 22–25, 29–30, 41–42, 165–166, 316, 336
checking with subtraction 39
estimation 22–31, 163–170
hundreds, tens, and ones 28–31, 41, 165–166, 315
hundred thousand and below 314–316
related to multiplication 47, 51–53, 101–102
tens and ones 23–27, 41
thousands, hundreds, tens, and ones 167–168
three or more addends 169–170, 318–319

division
applications 61, 66, 68, 195, 198, 200, 202–203, 206, 209–211, 336
checking with multiplication 212–215
estimation 197–202, 204–209, 212–215
facts 63, 65–68
hundreds, tens, and ones 195, 200–214
missing factor 58–61, 192–193
quotient, remainder (introduction) 209
related to multiplication 63–65
related to subtraction 62, 190–191, 194–196, 198, 200
tens and ones 199, 201
thousands, hundreds, tens, and ones 215, 324, 325

fractions
addition, like denominators 131–135, 138–140, 143–144, 248–250, 252–254, 334–335
applications 122–123, 125, 131, 135–137, 139, 141, 237, 240, 250
comparing 122, 126, 128–130, 144, 237–242, 251, 326
concept 122–125, 128
denominator (definition) 133
mixed numbers 142, 250, 252–254, 257
number-line model 127–131
numerator (definition) 133
region model 123–124, 126, 128, 132–133, 136–137, 142, 242–244, 255, 327–328
renaming 238, 242–249, 329–330
set model 125, 128
simplest name 246–247, 255–257, 332
subtraction, like denominators 136–140, 144, 249, 255–257, 334–335

geometry
applications 147–153
circle 150–152
cone 146–148, 152–153, 159
congruence
applications 291–292, 294–295, 297–298, 301–305
definition 293
tracing 293–296, 299
triangles 300–301
corner 155
cube 146, 154–155, 157–159
cylinder 146–147, 151–152, 158–159
edge 155–156, 159
face 155–159
measurements 317
plane figures (introduction) 157
prisms 146–147, 149–150, 152–159
pyramid 147, 152–153, 156–159
sphere 147–148, 151–153, 159
vertex 155–156, 159

graphs 224, 287

math sentences
applications 220, 224, 226, 230–234
equation 218–234
inequality 218–234

measurement
estimation 19
length
addition 75, 84-86
applications 74-75, 78-81, 83, 86
appropriate unit 74-75, 78, 83
estimation 9, 77-78, 80
metric symbols 82
subtraction 84-87
units 74–83

mass
applications 267-275
division 270-271
estimation 266
multiplication 268-271
units 266-268

time
applications 88, 91-95
day, week, month, year, century 89-91
decade 90
estimation 8
hour, minute, second 87, 89-93, 95
speed 94-95
symbols 92

money
addition 22–23
applications 22–23, 42, 44, 98, 117, 119, 203, 264–265, 267–277
comparing 260–262
converting 260
fractions of a dollar 261
multiplication 98, 103–104, 119
notation 261–262
subtraction 22, 263–264

multiplication
applications 48–49, 51, 56–57, 70, 98–99, 103–104, 106, 109–110, 115–119, 178, 181, 184, 336
arrays 48–51
checking division 212–215
estimation 104–107, 113
factors (definition) 64
facts 53–58, 115, 192
hundreds 193
hundreds, tens, and ones
1-digit multipliers 106–112, 118, 177–178
2-digit multipliers 118–120, 179–184, 320–321
missing factor 58–61, 192–193
multiples of 10 99–102
parts of the product 102, 109–113
product (definition) 64
related to addition 47, 51–52, 101
related to division 63–64
short form (introduction) 114
skip-counting 52–53
table 54, 64, 69, 99
tens 193
tens and ones
1-digit multiplier 102–106
2-digit multiplier 115–117, 320–321
thousands, hundreds, tens, and ones 106–107, 113

number
one 71
palindromes 171
patterns 43, 66, 187
puzzles 176
zero 71, 134

place value
addition 26, 28
million and below 5–7
subtraction 34, 37
thousand and below 4
value of digits 2–4

probability
applications 279, 283, 288
experiments 279, 284–286
graphing 287
likely outcomes 278–280
tallying 281–283

rounding 2, 10–20, 22–23, 32, 162–163

subtraction
applications 22, 34, 37–38, 40–41, 44, 172–175, 313, 336
checking with addition 40
estimation 33, 38, 40, 164, 172–175
hundreds, tens, and ones 35–38, 40, 42, 172–173, 311
hundred thousands and below 310, 312
related to division 62–63
tens and ones 33
thousands, hundreds, tens, and ones 174–175

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METRIC

LENGTH

10 millimetres (mm) = 1 centimetre
10 centimetres (cm) = 1 decimetre
10 decimetres (dm) = 1 metre
10 metres (m) = 1 decametre
10 decametres (dam) = 1 hectometre
10 hectometres (hm) = 1 kilometre (km)

AREA

100 square millimetres (mm^2) = 1 square centimetre
10 000 square centimetres (cm^2) = 1 square metre
10 000 square metres (m^2) = 1 hectare
100 hectares (ha) = 1 square kilometre (km^2)

MASS

10 milligrams (mg) = 1 centigram
10 centigrams (cg) = 1 decigram
10 decigrams (dg) = 1 gram
10 grams (g) = 1 decagram
10 decagrams (dag) = 1 hectogram
10 hectograms (hg) = 1 kilogram
1000 kilograms (kg) = 1 tonne (t)

VOLUME

1000 cubic millimetres (mm^3) = 1 cubic centimetre
1000 cubic centimetres (cm^3) = 1 cubic decimetre
1000 cubic decimetres (dm^3) = 1 cubic metre (m^3)

CAPACITY

Liquid and Dry

10 millilitres (ml) = 1 centilitre
10 centilitres (cl) = 1 decilitre
10 decilitres (dl) = 1 litre
10 litres (ℓ) = 1 decalitre
10 decalitres (dal) = 1 hectolitre
10 hectolitres (hl) = 1 kilolitre (kl)

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